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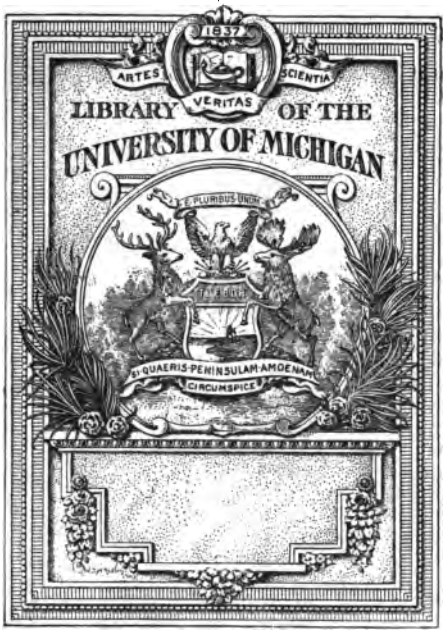
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SEVENTEENTH ANNUAL REPORT

OF THE

STATE BOARD OF AGRICULTURE

OF THE

STATE OF MISSOURI

FOR THE YEAR 1883.

JEFFERSON CITY, MO.:
TRIBUNE PRINTING COMPANY, STATE PRINTERS AND BINDERS.
1884.

Members of the State Board of Agriculture.

MEMBERS EX OFFICIO.

His Excellency, T. T. CRITTENDEN.
HON. W. E. COLEMAN, Supt. Public Schools.
S. S. LAWS, L. L. D., President of University of Missouri.
J. W. SANBORN, Dean of State Agricultural College.

APPOINTED BY THE GOVERNOR.

HON. JOHN WALKER.....Jefferson City, Cole county.
HON. N. J. COLEMAN.....St. Louis, St. Louis county.
HON. E. C. MORE.....Columbia, Boone county.
HON. H. ESHBAUGH.....Hanover, Jefferson county.
C. E LEONARD, Esq.....Bell Air, Cooper county.
J. A. POTTS, Esq.....Mexico, Audrain county.
W. M. HALL, Esq.....Vernon county.
M. FAIRCHILD DOUD, ESQ.....Kansas City, Jackson county.
JOHN R. RIPPEY, ESQ.....Glenwood, Adair county

J. W. SANBORN, Secretary.

200380

To the General Assembly of the State of Missouri:

The Sixteenth Annual Report of the Board of Agriculture is respectfully submitted.

The crop reports embodied in this general report tell of the past season as one of unparalleled fruitfulness. This fruitfulness is not confined to any one crop, but is general. Nor is it confined to crops, but extends to domestic stock, where good health and satisfactory growth are observed.

If our State consumed its food products, there would be no shadows in our skies. Our chief cash crop, wheat, has its value fixed in other markets. The prices now realized are phenomenally low and below cost of production, if the reports of our farmers given in this volume, may be relied upon. It is believed to be no misfortune to our farming interests to be thus weighted in its wheat product. It will encourage a greater diversification of our farming and better culture, a change that can only result in lasting good. The present price of wheat has met a ready response in the decreased area sown for 1884. This will be followed by an increased area of grass, clover and more stock, factors in all good farming, assurances that decreased acreage of wheat will be followed by an increased production per acre.

The work of the Board for the past two years has been directed to the diversification and intensification of our farm methods. Making no claim as the moving cause, we take pleasure in noting that our area to grass is now 20 per cent. of land enclosed for the plow, against 11 per cent. but a short time ago. A high ratio of tillage crops for sale, marks a robbery system of farming, and is not observed where high farming prevails. In the course of its labors it has encouraged our expanding creamery interests, has sought to ascertain the prospects of the sorghum sugar industry for Missouri, has investigated the new encouragement for fibre production for which our soil and climate are adapted. It has held several Farmers' Institute meetings, awakening an interest that proves their utility. During the crop season, the Board procured crop returns at much labor, organizing a corps of correspondents of 500, four in each county. Returns have been made in periods of four to six weeks. For this purpose circulars of inquiry were issued from the office of the Board.

These are the first crop reports issued by the State Board of Agriculture, and, we are pleased to say, have been gladly received by the farmers and the commercial world as the most accurate information at command of crop prospects and of actual crop returns. For this work no provision has been made for its expenses. The Board has at its disposal $1,250 a year, which is so small a fraction of the amount devoted to the work of Boards of Agriculture in our sister States that ours appears by contrast as virtually nothing. Several of these States devote to salaries in the Secretary's offices more revenue in one year than the Assembly devotes to our Board in two years for Institute meetings, printing of crop reports, postage, office expenses and salaries. Official crop reports are now no longer of questioned value. They give to crops a stability of price, and protection to the producer and consumer that speculators would not allow to exist in the absence of authoritative data. This and other legitimate work of the Board is carried forward to a degree of perfection in other States that our funds will not allow of. It is respectfully recommended that the Honorable Assembly increase the appropriation to the Board of Agriculture. Secondly, it is recommended that a system be devised and enacted for the collection of crop statistics by the county assessors. This would give a more accurate basis than is now reached by the volunteer work of crop correspondents. It would form a basis upon which the monthly reports of correspondents could be guided. That this work should be done, and completely done, has become more important since the abolition of the Bureau of Immigration. With a common consent people at home and abroad persist in assuming the duties of our board to be those that pertain to a Bureau of Immigration. Hence the Secretary is flooded with calls from intending immigrants for information regarding the resources of the State, as a whole, and also of its parts, prices, products, etc. While the nominal duties of the Board are to encourage, by active effort and teachings, better agriculture, we are forced to stand as advertisers of the opportunities of the State. This work we have been enabled to do, partly by private expense, only in an indifferent way for the past two years for absolute want of means, which is now hardly adequate for postage expenses.

Thirdly, the powers of the Board need expansion. It is now customary for Boards of Agriculture, in the great agricultural States, to hold fairs, live stock shows, trials of machinery and to exercise control over the fertilizer trade and diseases of domestic animals. In the latter direction, action cannot be taken too quickly. In climate, location and soil, we have unparalleled conditions for stock husbandry. We now have some of the finest herds of pure blooded animals on the continent. Our stock forms the basis of our most successful farming, and of our

prospects as an agricultural state; yet we are the only western State that exercises no concern over the fate of this great industry. States around us have protecting laws against either the importation or spread of diseases within their borders. We have neither. To the west of us the Texas fever, and to the east of us pleuro-pneumonia, both dreaded diseases, the latter an insidious dread disease, have prevailed during the past season. Centrally located, we are the highway from which it cannot be expected that contageous diseases will continue to happen to fail of invading us. The Board of Agriculture has been several times appealed to for aid regarding local diseases, but it has been powerless. The question is submitted for your consideration with the hope that comprehensive measures will be taken.

We have now arrived at a period in the development of the resources of our nation, and in the settlement of valuable lands, when a change in type of Western farming is imperative. The degree of depletion of our soils will give a strong impulse to change. All the conditions surrounding our state, including the activity of contiguous States, conspire to render an efficiently equipped Board of Agriculture, with an active, intelligent membership, of an importance heretofore unknown to Missouri. To your wisdom we appeal for aid sufficient for the efficient prosecution of the functions of the Board.

Respectfully suggested,

J. W. SANBORN, SECRETARY.

ANNUAL MEETING OF THE BOARD AT COLUMBIA, BOONE COUNTY.

AGRICULTURAL COLLEGE ROOMS,
COLUMBIA, Nov. 7, 1883.

In accordance with the law, the following members met at the office of the Board on November 7th:

H. Eshbaugh—Vice-President.

E. C. More.

W. E. Coleman.

J. W. Sanborr, Secretary.

No quorum being present, a recess was taken to 2:30 o'clock P. M

At 2:30 o'clock P. M., no quorum being present, an adjournment was voted to 10 A. M. of the 8th. At 10 A. M. of the 8th, M. F. Doud was present. Still lacking a quorum, a recess was taken to 2:30 o'clock P. M.

2:30 O'CLOCK P. M.

Met in accordance with morning vote.

Vice-President Eshbaugh in the chair.

Still failing in a quorum, no business was transacted of official character.

The afternoon was devoted to a conference, and resulted in an agreement that the Board, in accordance with the policy of the previous year, should hold at least three Farmer's Institute meetings during the winter.

It was unanimously agreed that an attempt should be made to procure and publish crop reports for the season of 1884.

It was furthermore resolved that the feasibility of the growth of the fibre producing plants for fibre, and of the sorghum cane for sugar be investigated and reported upon.

It was also resolved that the Board should, or ought to, encourage the spread of the creamery system of butter-making.

A strong purpose was manifested to do all on the part of the Board possible to be done, with the very limited funds at command, (about $600 a year) to develop an interest in better farming, and to aid in diversifying and intensifying the farming of Missouri.

On motion of E. C. More, the Board adjourned *sine die*.

J. W. SANBORN,
Secretary.

FIRST FARMERS' INSTITUTE MEETING

FOR SEASONS OF 1883-4.

The first meeting of the Board among and for the farmers for the years 1883-4, was held at Higginsville, December 18th and 19th. As this work is, on the part of the Board, in its infancy, the following poster for the Higgingsville Meeting is given, as illustrative of its purposes and methods in prosecuting this work:

FARMERS' MEETING BY THE STATE BOARD OF AGRICULTURE.

The State Board of Agriculture will hold a Farmers' Institute Meeting at Higginsville, by invitation of the Lafayette County Grange, on Tuesday and Wednesday, December the 18th and 19th.

The first session will be held on Tuesday, at 10 a. m., and will continue afternoon and evening to afternoon of the 19th.

Practical farm talks will be given. Professor S. A. Knapp, of the Iowa Agricultural College, and Geo. Lawrence, Esq., of Wisconsin will discuss the creamery system of butter-making. The President of the Board, Hon. John Walker, will review the "Progress of Agriculture." Prof. S. M. Tracy, of the Missouri Agricultural College, will give a horticultural talk. Hon. E. C. More, M. F. Doud and the Secretary will be present and give addresses. Among other topics that will be presented are a system of farming for success, stock feeding, breeding and improvement of farm crops, farm life and other subjects that may arise by special request.

Dr. S. S. Laws, L. L. D., President of the State University of Missouri, by special request of the county grange, will be present and take part in the proceedings.

FARM PRODUCTS.

Farmers attending the meeting are requested to bring for show or exchange any product that will have general interest. Your wives and

daughters, do not leave them at home, but bring them out to the afternoon and evening sessions. Hon. E. C. More will give an address of interest to them. Of special interest to the ladies also will be the Creamery and Horticultural questions.

OPEN SESSION.

While the Board goes to Higginsville on the invitation of the county grange, it is understood that it is open to all. All are cordially invited. The Board of Agriculture is a State organization, appointed by the Governor, formed for the promotion of agriculture, and is composed mainly of practical farmers. They come to you with no personal purpose to serve but to discuss the live practical farm problems of the day.

We ask a full attendance. Copies of the annual report of the Board will be on free distribution.

Per Order, J. W. SANBORN,
Secretary.

COLUMAIA, MO., Nov. 30, 1883.

The meeting was called to order by Hon. John Walker, President of the Board.

He said: "That he had been a farmer for fifty years, and had held the plow every year but one, this exception being during a trip to California, when he did not catch up with a plow. This missing year of the fifty, I yet mean to fill and round out a full half century at the plow." Continuing he said: "I know of nothing that I like better, but I came too soon to get the benefit of recent inventions. You younger men, who are aided by the genius of modern inventive skill, have a more inviting field before you than we older pioneers who have constructed your roads and cleared your fields with the ruder implements then at hand. Those were the days when we walked after the plow and held it. Now you ride.

The Board of Agriculture has been in existence nineteen years, and is at present made up of fourteen members, four of which are members *ex officio*, and ten are appointed by the Governor from gentlemen skilled in agriculture. The Board serves without compensation, other than that of traveling expenses, and some of the members have not even collected that. I have incurred expense every year without return.

Great progress has been made during the past fifty years, especially in certain directions. We know better how to grow grain than

to feed it. We have made but little progress in our methods of feeding, and much needs investigation in this direction. The Board should have funds to institute, at the Agricultural College Farm, trials in feeding cooked food, and to make other feeding trials with that would be of use to all feeders and thus procured for all at only one expense. The Board is endeavoring to procure and disseminate useful information."

The above is but a mere outline of the remarks of the speaker, delivered without notes.

Chairman Walker then introduced the Secretary, who proceeded to give a brief review of agricultural progress, showing that no other art, profession or science is receiving so full, broad and profound a study to-day as the art and science of agriculture. No other profession or industry has so many paid experts as are found in European and the few American experiment stations, aided by the volunteer work of Agricultural Colleges. Hence, no industry or profession is gathering so rich and full a literature as agriculture. Our business covers a wide range of the natural sciences, and has its own to found. This great work going on not only marks an era in farming, ushering in a new condition of affairs on the farm—changing the condition of the farmer socially and mentally, but an important period in the worlds' history, touching as it does, profoundly, the cost of living and its character in its luxuries and necessities.

Bacon said, on burning his agricultural books: "They contain no principles, therefore, they are of no use to any man." Strange as it may seem, all the ages have furnished to agriculture no laws. Upon no broad proposition in farming can a unanimous vote be got in this or any other farm audience. Facts are being, as noted, rapidly accumulated and laws are now being formulated in farming. But these facts are widely distributed in obscure pamphlets in hundreds of directions on both continents. It is the office of this Board to gather facts from all quarters, and to keep you informed of the latest developments in agriculture, and to present in well digested papers to you, upon special departments of farming, the best practices of the day at home and abroad. Meetings of this kind afford a mutual stimulus, whose effect, of course, there is no means of measuring. Other States have found such work profitable, and give from $10,000 to $20,000 annually. Ours gives $1,250. We will do the best we can with it.

CROP IMPRROVEMENT.

How to increase our crops was next considered by the Secretary in a half hour's talk.

The speaker emphasized the importance of attention to the breeding and selection of seed. Numerous illustrations of the importance of seed breeding were drawn from modern experiment trials. These trials have shown that density, size, quality and yield are governed largely by the character of the seed. It is for all of these qualities that we should select our seed. Dense seed gives dense product and larger yield, as well as heavier seed per bushel. In seven successive years of trial more complete than any known to the speaker, large, sound, whole potatoes were found to give a greater yield than by any method of cutting, and much larger than from small potatoes whole. One eye to the hill had given him the least satisfactory result.

In an experiment at the Agricultural College of Missouri for the year 1883, he had found that seed selected from the stalk in the field, of thirteen feet in height, had given, under accurate test, more fodder, in proportion to corn, than had corn selected from plants but about nine feet in height. Selection of seed-corn should be made in the field, where the plant would be visible, and should always be from a model plant. The earliest ripe corn of the type desired should be taken from hardy plants not over rank in size. Straight rows, well tipped out, small cob, as nearly uniform in size as possible throughout its length, kernels deep, compact and of the deepest color, are desirable. Other small points were named, the speaker asserting that the corn of the State shows great remissness on the part of our farmers in selecting, by its deficiency in several respects named.

The speaker then proceeded to discuss tillage of crops, advocating shallow culture for corn; appealing to his and others' experiment tests as proof of the correctness of his views.

Considerable discussion followed the talk.

Mr. Goodman had known three bushels of potatoes grown from one eye.

Prof. Tracy corroborated the speaker's statement regarding great yields from a single pound, and said 1,980 pounds were grown under B. K. Bliss's prize trials, four crops averaging 1,500 pounds.

President Walker spoke of the influence of climate on plants, saying that cabbages will not head in South Carolina, from seed.

Wheat taken from the North gave less blade, and from poor hills less leaves. The leaves may be considered as the lungs and a loss of leaf development is detrimental to the vigor of the plant. From a rich valley, where there is too much development of foliage, to the hills a change may be desirable, as this excess is overcome. Climate has a wide influence on plants.

Prof. Tracy—We should study climate before changing seed; the one from which we propose to change and the one to which we propose to carry a plant. I have tried wheat from Russia, England and several of the States. Of foreign wheat, Russian wheat had done best on the College Farm. English wheat had failed there in his trial. California and Oregon wheat had not done well. Change of climate changed the quality of plant and color of berry in wheat. From New York to Michigan, wheat had its gluten increased and the kernel hardened.

Mr. Longman, question—What changes are desirable?

Frof. Tracy—I don't know. The change should be slight. Wide changes, in degrees of heat and moisture, are not desirable, like changes from California and Oregon to Missouri.

Question by Mr. Goodman—Can the cabbage be inbred until it breeds out? I ask because my neighbors bought cabbage seed and none of them received a cabbage plant, but other unpromising plants.

Answer by Mr. Sanborn—So long as they germinate they will come true.

Question by ———Does it make any difference whether you select the top ear or bottom ear from the stalk?

Answer by Mr. Sanborn—The bottom ear should be selected. It is claimed that it is more vigorous and will give shorter stalks.

Question by ———Should we get our seed North?

Answer by Mr. Sanborn—From Columellas' time until to-day, the belief has strongly favored change of soil and climate. This view had the endorsement of Darwin. Gregory was sure that Northern potatoes gave better results than home grown. The speaker cited several instances in confirmation. So far as climate is concerned in wheat a diversity of views existed. Many able writers strongly favored wheat moved from the south, north, asserting that it was earlier and escaped better several foes that latter northern grown wheats had to contend with. This view seemed to be contrary to what we know regarding the change in climate on the time of ripening of corn. The claim that Southern wheat contained more gluten, so long believed in, is now thrown in doubt. The millers like it because harder, but give the wrong reason. I would not move seed from poor soil to good.

A recess was moved to 1:30 P. M.

AFTERNOON SESSION.

President Walker, in continuation of the morning discussion, recommended the stirring of wheat in a strong brine to float off the weed seeds and light wheat. Many do this to destroy or prevent smut in wheat.

He then called upon Secretary Sanborn for a few remarks while the audience were coming in.

Mr. Sanborn gave advice regarding the saving of seed, affirming that our farm practice in preserving seed is very deficient. It was shown that there is a great difference in the value of seed with a low vitality, due to improper preservation, that would germinate and grow feebly, and seed retaining its full value. Personal experience was cited showing that seed is subject to injury by fluctuations of dry and moist weather, or to heating in bins, or to bad weather after ripening. When the corn remains late in the field it has low vitality and if germinating growing with little vigor. It should be taken when ripe from the field and kept from excessive atmospheric moisture. Very narrow bins, or better, tracing, and keeping in a dry place, will amply repay the cost.

The Chairman then introduced Prof. S. M. Tracy, of the State Agricultural College.

FARM FRUIT GARDEN.

BY PROF. S. M. TRACY.

Failing to receive the expected paper from Prof. Tracy, the following brief newspaper notes of the address are given:

First—What to grow.

Second—How to grow it. As to soil, that which is good enough for corn is good enough for orchards. The location should be near the house. Buy for planting trees grown near home. Buy a choice variety, even if it costs more, and buy varieties ripening at different seasons of the year.

Don't dig big holes in setting, but dig just enough to give the roots their natural position, coat the roots with mud and pack the dirt well about and under the roots. Plant twenty-five feet apart each way and do not grow crops in the orchard after the trees have grown to considerable size, never after the trees are bearing. Cultivate during the entire season. Manuring and mulching always pay as well in the orchard as any where on the farm.

Plant plenty of grapes and small fruits, and do not be afraid of pruning vines. Plant the varieties known to be successful in your neighborhood. Do not pay big prices for new varieties, as they are not usually better than the old and well known varieties.

Plant early Richmond and English Morello cherries. Chickasaw and Damson plums, plant Kittatinny blackberries, plant plenty of strawberries and plant rows three feet apart and plants eighteen inches. After two years plant a new bed, as it will be less trouble than to care for the old one. Plant Crescent Seedling, Triumph and Kentucky varieties.

After giving full advice as to varieties and number of trees for an orchard, stock to cost $50 or less, he closed by urging farmers to see to it that their farms have a good orchard, because of the profit and luxury of having fruit for sale and use, and also because no investment equal in amount added so much to the value of the farm.

Chairman Walker—I now introduce to you L. A. Goodman, Secretary of State Horticultural Society, who will tell you what the State Horticultural Society is doing.

Mr. Goodman then came forward and gave a brief review of the work of the Horticultural Society. It is organized and assisted under a State law. It seeks to develop the horticultural interests of the State, interests that assume a very great importance, approaching that of agriculture, a department of which it is. 1,000,000 barrels of apples were sold in Kansas City last year. Local horticultural interests and societies are to be encouraged to unite their efforts with ours, and thus enable us to show to the world the capacities of our State for fruit culture, which are unexcelled. We have taken premiums almost everywhere we have exhibited. We have shown at New Orleans, Philadelphia and at other places. Our State is destined to become a great fruit State.

Mr. Waters spoke of the great expansion of fruit culture in late years. But a short time ago apples sold for ten cents a bushel, and now sell for from fifty cents to one dollar. I have great faith in orchard products.

Question—What apples do you recommend?

Answer by Prof. Tracy—For market the Ben Davis for the beginning and ending.

Q.—How about pruning?

Answer by Prof. Tracy—I never cut off a limb if I can avoid it; I do my pruning with my fingers or pen knife when the trees are young.

Q.—What distance should trees be planted?

Mr. J. C. Evans—It depends upon the position of your orchard; in

sheltered places wider apart than on open prairies where the winds have full sweep. In timbered sections he set twenty-one feet apart. On prairies he planted thicker, and as they grew and branched some he removed.

Q.—Will pruning of these thickly planted prairie trees prevent their interference?

Mr. Evans—No; I do not believe in pruning.

Prof. Tracy—The wound is liable to induce disease.

Q.—Should an exposed orchard have a hedge?

A.—No; the hedge will spoil the outside row.

Q.—Will not the setting back of the hedge obviate this difficulty?

A.—Yes; but you lose the land.

Q.—What is the cause of pear blight?

Answer by Mr. Evans—Our Horticultural Society has abolished from its councils politics and pear blight.

Q.—How can we destroy the borer?

Prof. Tracy—It is the immature form of the beetle. The egg is laid in the bark in June. It hatches and then eats its way to the inner bark, then working its way downward. He said the beetle always chose a tree that was not very vigorous, which had probably been injured by the plow. He recommended putting a piece of strong soap in the crotch of every tree, and the rains would wash the soap down over the trunk. By the middle of June the beetle has done its work. Trees only need such protection from the first of May till the middle of June. In September examine the trees, and if holes are found in them, follow the hole with the point of a knife. This takes time, but must be done, or the trees will be lost. He thought whitewash of little value to trees.

Mr. Goodman said the surest protection from the borer was to put tobacco stems around the trunk of the trees. Stems are scarce, and other methods must be adopted. He thought the beetle put its eggs at the root of the tree, in the soil. He had planted 1,000 trees, and each fall he went through the orchard with a spade and banked dirt up eight or ten inches around the trees, and in the spring he pulled it away with a hoe, and in five years had not seen a borer.

The Chairman—I now have the pleasure of introducing L. A. Goodman, Esq., who will give us a short talk on fruit farming.

FRUIT GROWING.

BY L. A. GOODMAN, SECRETARY OF STATE HORTICULTURAL SOCIETY.

Fruit growing, as a business, is coming to be one of the most important features in all our farming operations; in fact fruit farming is of itself a business and one of the most profitable of all farming operations if it be carried on in a systematic way and with good common sense.

Of all the fruits the apple, being the standard and the most important, will b l st spoken of.

In planting the apple orchard we must understand that we do not lose the land after the orchard is planted. It can be well cultivated in corn for five or eight years, then seeded to clover and timothy.

The fact of it is that we make too great a bugbear of this planting of orchards, when, in fact, they need no more attention in proportion than do the cattle in our fields, or the grain, or the horses, or the hogs. We think that when a tree is planted it should take care of itself, while a colt, pig or calf, we know needs attention all the time, and we give it to them. Let us do the same with our orchards and we will see a grand result follow.

Let a man plant ten, twenty, forty or eighty acres to apples and give the proper attention to them, give them as much care as you would your grain or your stock and in ten years you will begin to reap a rich harvest.

Wheat or corn will give $10 per acre and in ten years $100 per acre. Apples in ten years will give $100 per acre and will increase yearly after.

You can grow more apples per acre than you can corn and with less trouble.

Stock pays a good per cent on the investment, and yet the apple orchard will pay many times as much on the same money.

Let a man invest the same amount of money in fruit farming as in any other department of farming and he will find, with care, that his fruit farm will pay him better than all the rest.

I have in mind one fruit farm of forty acres of apples which last year produced $6,000. Many instances can be given of apples giving $100 per acre, and others of $150 to $200 per acre, and a few of $300 per acre.

I do not like to figure out profits for the future for we so often come short of our figures; but when these facts stare us in the face and we

have seen and know of them, it is no ways wrong to notice them. The whole secret besides that spoken of is in having the right varieties. I would give for a commercial orchard Jonathan, Penn. Redstreak, Huntsman, Rome Beauty, Willow Twig, Winesap, Jannett and Ben Davis. Distance, 30 feet.

The pear, as a profitable crop, is a failure in our western country. I am inclined to let it go unless we can find some suitable location where it will not blight, and that will be hard to do. For money, then, I would let the pear alone.

The peach is an item of profit, and of great profit, where it can be well grown and put upon the market in good shape. Fine peaches bring enormous figures even when there is an abundance of other fruits and common peaches.

The peach orchard is by itself a great investment. An orchard well taken care of will, in four or five years, bring in a good income and a handsome profit. Plant peach 16½ to 20 feet, taking 100 to 160 to the acre; cut them back after the second year and every two years after. They need the best of cultivation to make thrifty and healthy trees. We treat our peach on the too-much-let-alone plan, or fence-row plan, and cannot expect the best results from it.

The southern part of our State is destined to be the best peach country, for some of the cold winters injure the trees and kill the fruit in all the northern and central parts of the State, and we will have to look farther south for the peach belt. The peach orchard has paid more and will pay more than the apple orchard when we have a good crop, but we should, if possible, plant the peach and apple together, as the peach will be out of the way before the apple will bear much, and will by that time have paid all expenses and more for them both. I find that if I had planted all my orchard on that plan it would have been better for me, for those so planted have paid me the whole expense of the orchard for ten years, and if I had the whole planted the same it would have been thousands of dollars in my pocket. If thus planted, put the apple 33 feet and the peach between, with a row of peach also, making three peach to one apple.

The best varieties are Amsden, Crawfords Early, Foster, Troth's Early, Crawfords Late, Stephen's Late, Rare-Ripe, Smock, Salway, Heath Cling, Keport White and Wilkins. There are many new varieties that may be better, but these are the old stand-by's.

The cherry and plum are profitable for orchard, and the cherry can be planted between the apple the same as the peach and will prove a success in most soils. Early Richmond, Eng. Morello and Ortheim are the only ones fit to plant for market.

The plum should be planted entirely by itself for fear the curculio will spread. The Wild Goose is the most profitable and is very much so. I have seen trees that paid $10 each last year.

In fruit farming we must not neglect the small fruits, as they are an adjunct of the most profitable fruit farming.

You can grow strawberries between the apple trees or peach trees for three or four years, and then they will need changing. Raspberries and blackberries can also be grown the same way, especially where ground is scarce. But I now doubt the propriety of such a course, and would much prefer to have them by themselves, unless land is very scarce. A raspberry and blackberry patch will last a long time if not planted too closely, and if they are kept healthy and free from rust.

As soon as the raspberry patch fails to give a net income of $100 per acre, I would say cut them down, plow them up, and plant again.

Strawberries are the most profitable of all the small fruits on the same amount of ground. They will produce more bushels to the acre than will corn or potatoes, as a rule. They will bring ten times as much money per acre as will corn, or potatoes, or wheat. They grow quickly and the next year you have a good crop. They have produced 200, 300, 500 and 700 bushels per acre, and that the next year after planting.

The raspberry will give one-half of a crop the next year after planting, and the second year will give a full crop. I have had them pay $100 the next year after the planting and $300 the second year per acre.

Blackberries have rusted so badly that we have been obliged to give them up. But where they can be grown they will pay as well as raspberries, and there is to be a great demand for them, more and more every year.

For the strawberry for market I would plant Chas. Downing, Crescent, Monarch, Capt. Jack and Miners' Prolific.

For the raspberry plant Hopkins, Doolittle, Gregg, Miami, Thwack, and Cuthbert for south Missouri.

For the blackberry plant Lawton, Kittatinny and Snyder, (where they will do well.)

I believe we can yet obtain a native blackberry that will be just what we want, and for such an one many are watching and working.

I have purposely shown that fruit-farming will pay when one kind of fruit is grown, and now if they are all combined, as they should be on every fruit farm, there can be no question of the results of fruit-farming.

In fact, I may say that it is the most pleasant and profitable farming that can be engaged in. I except no kind of stock raising or grain farming.

One of my friends, twenty-five miles from market, was in bad health, and was obliged to rent out his farm. I advised him to take ten acres and put it into fruits of all kinds. He feared to do so on account of market, but finally did so, and he supplied all the neighbors for miles around with small fruits of all kinds, and the ten acres brought him more money than did all the rest of the farm.

Then to answer the question, "Does fruit growing pay?" I would say that well managed fruit farming is the most profitable of all pursuits.

Now, this is the bright side of the fruit business. But like all others, there is the dark side. I can give you just as dark a picture as the above is bright. Not one of the above facts but what I have realized in fruit farming, and could produce figures from hearsay far above those given.

But for the other side, I can tell you where I have planted 1,000 pear tress and grown them ten years, to see them all blight and die in two years after.

I can show you patches of blackberries that produced $300 to $500 per acre, that are entirely killed by the rust.

I have planted 2,000 apple trees—every one of them three times. The first year the grasshoppers killed them all; second year the drouth killed them all; third year nearly all lived.

You need not expect everything to go smoothly, but must take affairs as they come.

And yet after all, I reiterate the statement made before that fruit farming is one of the most pleasant and profitable avocations a person can follow.

One thing more, above all, fruit growing opens up a field as broad and grand and full of possibilities as can be found in any other calling. If a young man wants a field he can never fathom, here is one. Let anyone who loves nature take the field of horticulture.

Prof. Tracy—I have had some experience in accord with Mr. Goodman's lecture. During the past season, in Columbia, a good country town market, my neighbors sold strawberries for fifteen cents per box. I used two boxes in picking, putting the poor ones—about one box in four or five—into one box, and the good or best into nice boxes. I readily got twenty-five cents per box. We did not use our boxes a second time. This is a small matter as the boxes cost but a half cent each.

Chairman Walker—We should be glad to hear from W. Nelson McLain, of the "Kansas City Journal and Agriculturist."

Mr. McLain responded in a short talk that was not at the time taken, as Mr. McLain expected to write out his remarks for the secretary.

Confining his remarks to domestic animals he related, with some detail, favorable results secured by him in cooking food for swine and cattle. He recommended the practice to farmers. His experience was favorable to winter shelter and his belief was that farmers make a great mistake in the exposure to which they submit their stock.

Question. Does dry meal give cattle the scours? Many of our neighbors are troubled with the scours in cattle feeding upon dry meal, having lost several.

Answer. Mr. Sanborn—I have used only meal for years, excepting last year, in feeding cattle. My old neighbors fed on meal and no whole corn. In all my practice I have never lost one or known of one being lost in feeding meal. We are accustomed to its use and begin its use in small quantities, increasing the amount gradually.

EVENING SESSION.

The Board convened at 7½ o'clock.

Chairman Walker—While the audience is coming in Prof. Sanborn will give you a talk.

Prof. Sanborn gave a short talk on "The Relations of Science to Agriculture and the Utility of Education to the Practice of Farming." This talk recounted the facts discovered by special investigation during the last thirty years, and then showed their application to economic farming.

FARM PROGRESS FOR FIFTY YEARS.

BY HON. JOHN WALKER.

[Taken from report in Globe-Democrat.]

The President, Hon. John Walker, then addressed the meeting on "Agricultural progress in fifty years." In speaking of the estimation that is periodically professed, about election time, for the noble calling of husbandry and for "the horny handed sons of toil," he said that it was refreshing to know that there was a time when these professions had some show of genuineness. Four thousand years ago the Emperor of China once each year went into the field, and with bare head and bare hand held the plow and turned the soil, and ordered the colonels of his regiments to do the same in honor of agriculture. Now if the half civilized man did this, what should the man of to-day do in her honor? He then sketched the history of improvements in implements from the time when the soil was turned with the stick and the rude spade, then the hoe, then the rude wooden plow drawn by cattle, when each one of the little mean oxen was smaller and meaner than the other one. He told of the wooden plow with the cow horns on the ends of the handles, when the horns on the handles were more dangerous than they were on the head of the cow, and it was dangerous to the shins on account of the roots being broken and flying back. Then came the old iron mould board of the Wheeler type, and then the diamond plow, when it was believed that the height of perfection had been attained, but now we have the riding sulky plow in all its various fashions. Then they had the reaping hook, by which about one-quarter of an acre per day could be reaped. Then the cradle, by which two or three acres of ripe wheat could be harvested, and now the reaper and self binder with their astonishing results. Fifty years ago, before the days of barns with good floors, there was the threshing floor and the flail, then the barn floor and the flail and the rude cleaner. Then the tramping floor, then the ground hay thresher, and now the separator, driven by steam power, running about the country like a thing of life. Then in early days, when he was a boy in Missouri, they had no mills, and they burned a hole in a log and used that for a mortar in which to reduce the grain by pounding. Speaking of the coarse food used in those days, the speaker said he believed that if he had had such food as people live on nowadays in Missouri he would probably have grown to fairly respectable size. (The judge is about 6 feet

4½ inches in height, and finely proportioned.) Then came the horse, with its slow, laborious, crude work, and the tedious hand feeding and waiting for turns at the mill.

The crude processes of the manufacture of flax and wool into cloth by hand were brought into striking contrast with the processes and the clothing of to-day, and he told of how the ladies of his earlier acquaintance took spools of bright colored yarns of flax and wools of their own manufacture to their little social gatherings and discussed the methods of making different patterns and combinations of gay colors in fanciful designs, and gossiped about the new patterns, much as the gentle sex do in this later day when they find the most delicate tints and beautiful designs made ready to their hand; in this later day when arrayed like the lily, they toil not neither do they spin. In those days there was free handed and open hearted generosity, and men were more earnest and common honesty was not uncommon.

In those days things were called by their right names, and if a man was a criminal he was ostracised as a criminal.

He spoke of the copper distilled whisky which was the common beverage of the earlier days, and which the neighbors used to sit and sip, and then becoming talkative, they would tell the news and still sit and sip and tell all they never knew, and now, although he had been on the same farm and plowed the soil for every year of the past fifty years with his own hands, except one single year spent in California, and had lived the life of the early frontiersman, he never yet had taken a single drink of intoxicating liquor. He said keep the prohibition agitation out of politics and practice it rigidly and quietly in our homes.

The large audience was held spellbound by the speaker's easy flow of speech, his stirring eloquence and the brilliant scintillations of mirth and humor with which the speech abounded, and which was so full of the actual history of the progress of the State. This closed the first day of the most interesting farmer's meetings ever held in the State.

Adjourned till 10 o'clock Wednesday morning.

WEDNESDAY—MORNING SESSION.

PRACTICAL FARMING.

BY M. F. DOUD.

Mr. M. F. Doud, of the Kansas City Farm and Stock Journal, spoke on the subject of "Practical Farming." He asked how many farmers can tell at the end of the year whether they have made or lost money on stock, whether one branch of agriculture was not being carried on out of the profits of another branch. Twenty years ago one man could cultivate five acres of corn a day with a plow and horse. Now, with a riding cultivator he can only cultivate three acres a day. The walking plow does as good work, and a little more of it. The breaking plow is the same; a man can break more land, and do it better with the walking plow and two horses, than he could with a riding plow and three horses.

Dr. S. S. Laws, of the State University, enquired if farmers accepted the view of the speaker regarding sulky plows. He would like to see an expression of opinion.

Vote—Only a few hands up in favor of a sulky plow.

This vote brought forth a lively discussion, many taking sides with the riding cultivators and plows, and many more siding with the walking plow.

Mr. J. T. Ferguson had bought a riding plow, and in a week his team was broken down. When a man walks he don't kill his team.

Mr. W. H. Robnett said he had farmed considerably, and had used both plows. He could take a walking plow and break more land in a day, and do it better than any man could do with a riding plow and three horses. If we want to utilize the labor of cripples, the riding plow is a good thing.

Mr. J. H. Gladdish saw many arguments in favor of the riding plow. Many farmers have boys too small to walk, who can do a man's work with a riding plow. He had a field covered with weeds so high that when he rode through them on horeback, he had to hold up his handkerchief for his boy to lay off the lands by. After it was plowed, no one could tell that it had ever been weedy.

Prof. Sanborn said he had tested both plows with the dynamometer, and the riding plow ran much heavier up hill than the walking plow, and easier down hill.

Col. C. H. Weber, of St. Louis county, thought the riding plow a good thing, but he advocated the cause of the much neglected hoe and spade.

Col. McClelland was called for, but begged off. Mr. G. De Bernardi, State Grange Lecturer, was also called for, but begged to be excused.

The Chirman—We have with us Dr. Laws, a member of the Board, and President of the State Agricultural College. He has not come to give us an address, but may consent to make a talk.

AGRICULTURAL COLLEGES.

Dr. Laws stated, among other things, that the college farm at Columbia contained 640 acres, and that the college had received less land than it was rightly entitled to, and that Congressman Cosgrove would introduce a bill in the present Congress to give to the college its share of the public domain. He said the agricultural colleges of Europe could not compare with those of our own country. There they had two classes of instruction —one for the sons of the nobility and the other for the peasant. Here all were alike admitted to the one course of instruction. We give an education which can be secured no where else at the same cost. In our annual catalogue we say if any student expends more than $200 yearly his parents should call him to account. While at Cornell the tuition fee alone is $75, at Yale and Cambridge it is from $500 to $1,000. The owner of the land is the ruler of the government, and your position is a novel one in the world's history. Here the speaker read several beautiful passages from Socrates, expressive of the high estimation in which agriculture was held in those days. Continuing, he said that in the House of Lords were eighteen statutes representing eighteen barons who exacted the magna charta, and why was the magna charta exacted? Because these barons were the owners of the soil and resisted the efforts to cheat them of their land. Next Sunday, December 23d, is the centennial of the return by Washington to Congress at Annapolis of his commission. His work was done. There stands his statue,

resting upon a plow, the emblem of agriculture, showing that Washington was a farmer. The suggestion is made that this plow is from a model of the one invented by Thomas Jefferson. On the college campus at Columbia we have a copy of that statue and the original statue erected to Thomas Jefferson, and only last summer the Misses Randolph presented to our State the original marble slab containing Jefferson's epitaph. In the presence of such memories the youth of the college have an incentive to study. Then, in a few words of eulogy of Missouri as a State, saying he would not exchange Missouri for all the territory in the same latitude from its western border to the Pacific coast, the speaker closed.

To the above quotations taken from the notes of the reporter of the Globe-Democrat, the Secretary desires to add that the central idea in the remarks of Dr. Laws, was that our system of land tenure is entirely unique and of profound significance, being far reaching in its influence. A stimulus to personal ambition, it gives a highly effective agriculture so far as the results of production per man are involved. It touches the firmness of the foundations of a republican form of government, and even of our social fabric. In its ultimate influence great good is to be expected in its relation to farm character and farm results.

The Chairman: "I now have the pleasure of introducing to you Hon. E. C. More, of Columbia, and member of this Board.

FARM HOMES.

BY HON. E. C. MORE.

LADIES AND GENTLEMEN—If, as many believe, life on the farm is the most desirable "In the world's broad field of battle, in the bivouac of life," why is it that so many of the children of American farmers are anxious to find occupation in towns and cities? And why are they encouraged in so doing by their parents?

I can only account for it by reference to the natural perversity of the human heart, ("native cussedness," the poet would call it.) That love of change which seems to be almost an unalterable law of our being.

The Latin poet, Horace, well understood this principle of human action, and graphically describes, or rather illustrates it in one of his satires, the first, I believe.

Never satisfied with what we have around us, we turn with longing to the charms and scenes which distance robes with enchanting attractiveness; concealing, however, the attending evils, and sorrows, and vexations.

> At summer's eve, when Heaven's ethereal bow,
> Spans with bright arch the glittering hills below;
> Why to yon mountain turns the musing eye,
> Whose sun-bright summit mingles with the sky?
> Why do those cliffs, of shadowy tint, appear
> More sweet than all the landscape winding near?
> 'Tis distance lands enchantment to the view,
> And robes the mountain in its azure hue.

This was also the solution of another poet, and it must be the true one. As a general rule, no matter what a man's profession or calling in life, he is apt to imagine that something else would suit him better; and in ninety-nine cases out of one hundred, is unwilling that his children should follow in his footsteps.

Ask the doctor if he desires his son to become a physician; the answer is, "no, indeed;" he does not wish him to be closeted with skeletons and ghastly dissection; to be examining tongues and feeling pulses all his life; nor to have him spend his nights riding through storm, and rain, and cold, even though the holy mission be to relieve suffering humanity.

Ask the lawyer, he answers, "never, sir;" my child shall not wear away his existence poring over musty tomes vainly attempting to trace the golden thread of justice through the intricate labyrinth of human transactions, interwoven with the ponderous texture of civil and criminal jurisprudence.

Ask the hardy mariner, whose good bark has borne him prosperously over the bounding billows of the broad blue ocean; he prefers that his children should remain on "*terra firma.*"

The banker and merchant do not wish their sons to spend their lives in the counting room or store, watching with feverish anxiety the fluctuations of bonds and markets, finally, perhaps, going down before the vigorous onslaught of the bulls or bears. Generally, too, the feeling is heartily reciprocated; the children are no less anxious than their parents for a change.

Who ever heard of a clergyman's son becoming a preacher of the Gospel? A poets' son, who could write even respectable doggerel? Or a professor's that would take a decent education?

So, too, the farmer; no exception to the general rule, is apt to conclude that his boys and girls must go to town and live; they shall not remain tillers of the soil, hewers of wood and drawers of water. Oh, no; he wishes them to teach school, to become clerks, bankers, doctors, lawyers, and what not.

Some crusty old bachelor has likened matrimony to a beleaguered city where those who are *out* want to get *in*, while those who are *in* ask nothing better than to get *out*. I don't wish to be considered as subscribing to this doctrine, but the comparison holds good in many of the walks of life. Those who live in town want to go to the country, while those who live in the country are anxious to move to town. Now, I do not fail to recognize that life in town has many advantages of which those who live in the country are more or less deprived. So, also, has life in the country charms and benefits which the dwellers in towns and cities cannot enjoy.

Well, it takes all sorts of people to make up a world. Some must live in town, some in the country, others still must face the storms of old ocean, and when the science of aereal navigation is more thoroughly perfected, doubtless there will still be another class who will be inhabitants of the air.

I am not called upon to criticise the taste or judgment of those who differ with me, still I think I can furnish good reasons for my partiality for the country. However, my philosophy teaches me that, as a general rule, life can be made either happy or unhappy under any ordinary circumstances; in other words, that, to a very great extent, each one is the architect of his misfortune, the controller of his own destiny.

Home is what home folks make it, whether in town or country, on land or sea. My claim is, also, that, as a general rule, the position of the American farmer is the most desirable, and should not be exchanged unless for good and substantial reasons, which, of course, in many instances, do exist. I know that in some cases nature has bestowed talents which cannot have full scope on the farm. Many have not the health and strength to pursue an agricultural life; many have not the means. To these and many similar cases my remarks are not intended to apply.

My position is simply this, that when other circumstances are favorable farming is the best and happiest occupation. It is the most independent life in the world; provided, always, the farmer is wise enough to keep out of debt. It is the most healthful, and most surely leads to success and competency. I take it for granted that no sensible person will voluntarily accept *mediocrity* or *inferiority* where success and superiority are within his grasp. Now, we cannot all be merchant

princes, nor great doctors, nor eminent jurists, nor poets, nor fine architects, nor artists, but I say that any man, with good, natural endowments, may, by a fair exercise of brain and muscle, become a good farmer.

Those who live in the country can, better than others, control their time, being less hampered by the irksome and sometimes absurd restraints of society. Many of our greater statesmen have passed their early life upon the farm, and almost always spend their leisure hours in the country, away from the busy bustling haunts of the metropolis. Poets have drawn their purest and loftiest inspirations from communion with nature, and a contemplation of her charms divested of the glare and glamour of pretentious art. Whenever a poet has wished to draw a picture of peace, contentment and true happiness, the scene is always laid in the country; from the classic days when Virgil wrote his pastorals and bucolics for the delectation of the Emperor Augustus and his court of Princely Romans, down to the present time, when Whittier tells us how "Maud Muller on a summer's day raked the meadow, sweet with hay." The philosopher, the student, the artist all go the country for inspiration, health and recreation. The merchant, the banker, the doctor, the lawyer, the artisan, the mechanic, the learned professor and the astute editor all look forward to the time when, having acquired sufficient of wealth or glory, they will retire gracefully from the cares of business to the quiet, peaceful enjoyment of the country.

> "There is a pleasure in the pathless woods,
> There is a rapture on the lonely shore;
> There is society where none intrudes,
> By the deep sea, and music in its roar.
> I love not man the less, but Nature more."

Assuming, then, that the farmer's life in this country is as much, if not more, desirable than any other, may I claim your indulgence while I offer a few suggestions on some of the most important duties of the farmer.

I shall not weary you, ladies and gentlemen, by reminding you that the farmer should be an early riser; that he should systematize his labor; should keep a strict account of his profits and expenditures; should, by all means, keep clear of debt, and a hundred other most excellent rules, with which you are all doubtless familiar, and which are so impressively and beautifully taught in the lessons of the Grange. What I wish to say is this: The magic key which in this and every other department of life opens the portals of success is *intelligent education*

Country life means not alone tilling the soil, feeding swine, raising stock and keeping up good fences; these are certainly all very important and profitable accomplishments; and many think, if in addition to them, the farmer has some little knowledge of reading, writing and arithmetic, it is enough. Not so, my friends. This is a progressive age, and with the land teeming with schools and flooded with books, periodicals and newspapers, all full of useful information, it will never do for the American farmer of to-day to fold his hands, contented if he knows *tolerably* well how things were conducted on a farm fifty, thirty or even ten years ago. The calcium light of investigation is shedding its healthy glow upon all departments of labor and science, and the means of information are wonderfully increased within the past half century. With all the improvements in machinery and the present thorough dissemination of agricultural knowledge, the farmer of to-day, by a reasonable systematizing of his time, may well aspire to raise first class crops, the finest kind of stock and still find time for the cultivation of his mind, the beautifying of his home and the improvement and recreation of the family circle. He will find time to study the constitution and laws of his country, the system of government under which he lives, as well as the daily price of all the great staples in the principal markets of the world.

The exercise he takes upon the farm naturally preserves his health; and every farmer should devote a portion of the twenty-four hours systematically to the culture and improvement of his mind by judicious reading and writing, and discussion of various matters of practical and public interest. These lessons are all taught in the Grange, and one reason why I have always believed in this Farmers' Society, is on account of the familiarity it furnishes in parliamentary law and usages, as well as the opportunity it affords of discussing important subjects among themselves.

The Grange has done a good work in this direction, and, my friends, I hope that good work is still only in its infancy. The Farmers' Society should not be allowed to became extinct. There is no other class of individuals who more need the improving influences of a society of their own than the famers.

The farmer should naturally be a man of good taste. Surrounded as he is by all that is good and pure and beautiful in nature, he is, more than any other man, the true priest of Nature, whose very occupation leads him, as it were, to the portals of her temple; and in ornamenting his home with trees and shrubs and flowers, in caring for the animals, (the inferior children of Nature), and winning from them in return an attachment and fidelity that are oftentimes most beautiful and touch-

ing, he is simply interpreting the oracles of Nature. And Nature, my friends, is nothing but the impress of deity.

I notice that the announcement of this meeting rather commits me to saying something of interest to the ladies. Well! that was put in without consulting me; but I am always proud to be considered on the side of the ladies; and certainly, if I only knew exactly what sort of speech would please them on this occasion, I should be certain to make no other, for when the ladies are really pleased, all sensible men are sure to be in the same fix, and therefore I should have satisfied all parties.

"As unto the bow the cord is,
So unto the man is woman,
Though she bends him, she obeys him;
Though she leads him, still she follows;
Useless each without the other."

Woman's mission on the farm is just what it is in every other department of life, viz.: to be the helpmate of man—the companion of his joys and sorrows—to brighten his existence and lighten his labor. And whether in country or city home; poverty or wealth; in the ball room or on the battle field; in the sunshine of prosperity or in the shadow of sickness and death, she is still the same golden link that connects fallen humanity with heaven.

"Oh, woman, in our hours of ease,
Uncertain, coy and hard to please,
And variable as the shade
By the light quivering aspen made,
When pain and anguish wring the brow,
A ministering angel thou!"

The farm home, like every other home, is far from complete without the presence of woman. Some of the departments in country life come peculiarly within her proper dominion and sphere. As in the poultry department; the dairy department; the garden department, and in most all matters connected with the household. In these she should have unbounded sway and all the assistance she needs, and if she kindly takes an interest in other matters on the farm, the farmer, if a true man, will greet her as did the Lion Hearted Richard of England: when sick and petulant he lay upon his couch in far off Palestine, his queen, the lovely Berengaria, ventured to approach, though access had been forbidden to all—she timidly expressed the hope that she did not intrude. His reply was: "Can a sunbeam be an intruder in a dark

and dreary dungeon?" If a man has true manhood, and is not himself guilty of too many *breaches* of proper conduct, there is not much danger of his wife undertaking to wear the *breeches*.

Some men's idea of woman's duty upon the farm is about like this: she should get up at 4 or 5 o'clock A. M., make fire and get breakfast, then call him. Afterwards there is, perhaps, milking, churning and washing, besides getting dinner and supper, making shirts, patching, darning, mending, etc., until bed-time.

I have no patience with an individual who remembers only that woman is man's helpmate, and *never* remembers that man is or *should* be her protector, and is expected to bear the real burdens of life and make them as light as possible for the gentler sex.

Men who cannot appreciate this are unworthy to be called men; unworthy to be called farmers, and be entrusted with the care of horses cattle or animals of any kind.

In dealing with all animated creatures, whether of the human family or among the inferior animals, kindness yields a better return than any other currency on earth.

There is a little poem which illustrates quite forcibly this truth, and with your kind permission I will read it to you. It is entitled—

"LOVE LIGHTENS LABOR."

"A good wife rose from her couch one morn
And thought with a nervous dread
Of the piles of clothes to be washed, and more
Than a dozen mouths to be fed;
There's the meals to get for the men in the field,
And the children to fix away
To school, and the milk to be skimmed and churned,
And all to be done this day.

"It had rained in the night, and all the wood
Was wet as wet could be;
There were puddings and pies to bake, besides
A loaf of cake for tea.
And the day was hot, and her aching head
Throbbed wearily as she said:
'If maidens but knew what good wives know,
They would be in no haste to wed.'

"'Jennie, what do you think I told Ben Brown?'
Called the farmer from the well;
And a flush crept to his bronzed brow,
And his eyes half bashfully fell;
'It was this,' he said, and coming near
He smiled and stooping down
Kissed her cheek—'Twas this, that you were the best
And the dearest wife in town.

"The farmer went back to the field, and the wife
In a smiling and absent way,
Sang snatches of tender little songs
She'd not sung for many a day;
And the pain in her head was gone, and the clothes
Were white as the foam of the sea,
Her bread was light and her butter was sweet
And as golden as it could be.

"'Just think!' the children all called in a breath,
'Tom Wood has run off to sea,
He wouldn't, I know, if he only had
A home as happy as we.'
The night came down and the good wife smiled
To herself as she softly said:
"'Tis so sweet to labor for those we love,
It's not strange that maids will wed.'"

In a word, a reasonable application of those principles which make home happy anywhere, will be found equally as efficacious on the farm.

By all means let the country home be made as comfortable and as attractive as our means will reasonably allow.

The inhabitants of towns and cities are not, as a general rule, so dependent upon *home* pleasures as those who live in the country, having more frequent opportunities of spending their evenings and leisure hours away from the home circle, engaged in entertainments of a religious, literary, musical, theatrical or social character. The farmer, on the other hand, generally spends his evenings and rainy days at home. And probably in no other walk in life is there developed so highly the appreciation of Howard Payne's expression, "Be it ever so humble, there's no place like home." This love of home is one of the purest and noblest sentiments that can animate the human heart—whether it beats in the bosom of the lordly millionaire or beneath the jacket of the simple day laborer. It is an affection which neither time nor space can obliterate. It carries us back on the wings of memory over mountain and plain, beyond river and ocean, to that hallowed spot we have learned to love as home. The fond memories of childhood cluster about the name. The strong ties of manhood are linked with it. The lonely heart of the exile and foreigner is cheered by the tender memories of home; and, in my judgment, a peaceful, happy, contented home is more to be desired than great wealth, or fame, or political distinction.

Patriotism and love of home are kindred sentiments and always intimately blended. Find me a patriot who loves his country and I

will show you a man who loves his home and cherishes his household gods, the Lares and Penates of the ancient Romans.

No rallying cry was ever more potent than that which summoned brave, true hearts to the protection of their alters and firesides.

No verse in the English language is more thoroughly indorsed and appreciated than the simple words written by an American wandering in a foreign land, far away from the scenes of his native land:

"'Mid pleasures and palaces though I may roam,
Be it ever so humble, there's no place like home;
A charm from the skies seems to hallow us there,
Which seek through the world is ne'er met with elsewhere."

This simple ballad, set to sweet music, has thrilled the hearts of thousands all over the world wherever the English language is spoken. A story is told illustrative of the wonderful power and influence of this beautiful ballad when properly rendered by true genius:

It was many and many a year ago, in a country by the sea; a wise and discreet ruler governed a vast province, and under his benign sway the people were happy and prosperous. On one occasion in the chief city of this empire, a lovely woman, the child of genius and beauty, in the presence of a large and fashionable audience sang with matchless pathos and melody this beautiful balad "Home, Sweet Home." All hearts were touched, and when a day or two afterwards the aforesaid wise and judicious ruler met the lovely singer, so carried away was he by the enchantment of her sweet music that he feelingly exclaimed, "Madam, I may never see you again" and tenderly but respectfully kissed her.

For the entire truth of the story I cannot, of course, vouch; but it serves to illustrate the great power of that wonderful balad.

Home generally means a place around which, through long associations, are entwined the tender affections of the human heart. It may mean a palace, surrounded by every luxury; it may mean a simple cottage, like that of honest John Peerybingle, upon whose hearth the cricket nightly came to chirp forth the little household fairies, who were so loyal to patient, gentle, faithful Dot. But whatever the character of the edifice, home must ever be a sacred word in the vocabulary of the honorable, the brave and the true.

A true home is not necessarily made and completed in a few days, or weeks, or even months. It is more frequently a matter of years. In the beginning it may be, comparatively speaking, a waste, a barren, a wild, and it is not *alone* the buildings we erect to shelter ourselves and our animals that constitute the home.

In addition to these and the advantages nature may have bestowed are added, from time to time, those smaller objects which contribute to our comfort or please the eye. A tree, a shrub, a flower planted from time to time, a pathway improved, a vine trained to its proper position, an arbor constructed, or a rustic seat, a book added to the shelf, a picture hung upon the wall, even a song-bird encouraged to build its nest and make its home in a neighboring tree, all contribute to make the home attractive. Nay, more in the process of time, home becomes dearer to us from having been shared by friends and kindred spirits. Thus Tom Moore, describing the beautiful vale of Avoca, tells us that

"It was not that nature had shed o'er the scene,
Her brightest of crystal, her purest of green,
It was not the soft magic of streamlet or rill;
O, no; it was something more exquisite still;
'Twas that friends, the beloved of my bosom were near,
Who made every scene of enchantment more dear."

And I presume we have all felt

"How the charms of nature improve,
When we see them reflected from looks that we love."

So these numberless associations and little additions extending through the flight of many years, it may be, all contribute very largely to make up what at last we have learned to love and cherish as home. The changes have been gradual, almost imperceptible: So that home grows to be dear and beautiful to us as gradually and imperceptibly

"As the daylight comes when the night is done,
And the crimson streak,
On old ocean's cheek,
Grows into the great red sun"

"As gradually as the spring time
Its crown of verdure wears,
When all the trees on all the hills,
Open their thousand leaves."

If the farmer has not the means to build a beautiful mansion and entertain a land-scape gardner, and a retinue of servants, he can at least have things neat and tidy about his country home; from time to time put out an ornamental tree or flower; keep bright, warm fires in the winter time, and at all seasons, by example and precept, inculcate cheerfulness and contentment, letting the glad beams of love and affection always throw their sunshine over the whole scene.

If this is done, aside from the cares and sorrows, the trials and misfortunes which are a portion of the common lot of mankind, the days and years of the American farmer will be as pleasant as any on earth, and in the language of America's greatest poet:

"The night shall be filled with music,
And the cares that infest the day
Shall fold their tents like the Arabs,
And as silently steal away."

AFTERNOON SESSION.

CREAMERIES.

BY GEO. LAWRENCE, WAUKESHA, WIS.

THE DAIRY.

This great industry is rapidly developing. Its present prosperous condition proves to us its permanency. In pointing out to you its many favorable advantages, I shall try and make it plain from personal experience.

Parties starting creameries, many times, are fearful of overproduction, and that our markets will be overstocked with first-class goods. Seventy years ago the first cheese was made in Herkimer county, N. Y., selling for 2 cents per pound. In 1840 the first American cheese was exported, and in ten years the export was 15,000,000 pounds. In 1850 prices ranged from 6 to 6⅞ cents per pound for cheese.

After the people of the Old Country became acquainted with the fine quality of our dairy products, the foreign demand increased, and prices of both butter and cheese boomed up much higher that at present.

But to-day our markets are steady, prices good and demand increasing.

The export of cheese for 1881 was 148,000,000 pounds, amounting to $16,380,248. Butter, the same year, exports, 31,560,500 pounds, amounting to $6,256,024, showing plainly that foreign demand has increased sales at good healthy prices. At the same time home demand has equally increased with a steady foreign demand. To show what the dairy interests have done for the United States, the New York Sun figures it that over $2,000,000,000 are invested in the dairying business. This amount is almost double the money invested in banking and commercial industries. It is estimated that it requires 15,000,000 cows to supply the demand for milk and its products in the United States. To feed these cows, 60,000,000 acres of land are under cultivation. The agricultural and dairy machinery and implements in use are worth over $200,000,000. The men employed in the business number 700,000, and the horses nearly 1,000,000. The cows and horses consume annually 30,000,000 tons of hay, nearly 90,000,000 bushels of corn meal, about the same amount of oatmeal, 275,000,000 bushels of oats, 2,000,000 bushels of bran, and 30,000,000 bushels of corn, to say nothing of the brewery grains and questionable feeds of various kinds that are used to a great extent. It costs $400,000,000 to feed these cows and horses. The average price paid to the laborers necessary in the dairy business is probably $20 a month, amounting to $168,000,000 a year. The average cow yields about 450 gallons of milk a year, giving a total product of 6,750,000,000 gallons. Twelve cents a gallon is a fair price to estimate the value of this milk at, a total return to the dairy farmer of $810,000,000. Fifty per cent. of the milk is made into cheese and butter. It takes twenty-seven pounds of milk to make one pound of butter, and about ten pounds of milk to make one pound of cheese. There is the same amount of nutrition to 3½ pounds of milk that there is in 1 pound of beef. A fat steer furnishes 50 per cent. of boneless beef, but it would require about twenty-four million steers, weighing 1 500 pounds each, to produce the same amount of nutrition as the annual milk product does.

While cheese is a luxury, butter is a necessity; but few use cheese while a majority use butter. The rich, the poor, the high, the low, use butter. A few years ago we found on our market none but dairy butter. Creameries are a new departure. Since this enterprise started, creameries have been started all over our land, and prices not only have increased, but demand for first-class butter has equally increased. Where dairy brings from ten to twenty cents per pound, creamery brings from twenty to forty cents a pound. Sections of country where creameries are in operation receive one-half more net cash than they did before building a creamery. The imitation stuff called butter com-

petes directly with dairy or home-made butter. While the last named can scarcely find sale in job lots, creamery sells readily and stands above reproach with no competition.

What the dairy interest has done for us in the North, it can do for you.

Not many years ago our farmers were found ploughing, dragging and harvesting the great crop, *wheat*, everything was subservient to king *wheat*.

We may say that three-quarters of our farmers were in debt, more or less; mortgages were tied fast on the farmers, drawing big interest, and they considered the only way out was to raise wheat. They made this a *specialty*. Grass, corn, oats were raised only by necessity, to carry such stock as they then had, and most of the hay was marsh or low land hay.

Wheat has its enemies—chintz bug, rust, the Hessian fly, drouth, and many other things that tend to make the crop uncertain, and farmers found to their sorrow that they had not solved the problem; it was hard work to meet the interest, and much more hard to pay the debts; land was depreciating in fertility, the farmer discouraged and buildings became dilapidated; wives and daughters were overworked, with no time to develop their mental qualities; fences never repaired, the stock they had run at large, in fact everything seemed to be on the downward tendency under this administration. Some ten years ago cheese factories made their appearance. Farmers patronized these by sending the product of the cows they then had. Finding it a paying business, they increased their stock of cows; those that stared with four or six put on their farms from twelve to fifty cows, at the same time increasing their stock of hogs, feeding them the refuse from cheese factories, called whey, which we consider a little better than water.

Butter factories were conceded to be a paying investment, so creameries on the cream-gathering plan started, relieving the good wife of many burdens and cares. In the place of several cheese factories, with the necessary apparatus and expense of running them, one creamery is all that is required. In a radius of ten miles cream can be collected. This is done at the expense of the creamery; the farmer is relieved of delivering the milk; teams can commence work in the morning, which is an important item in busy seasons of the year; skim milk is left at home to raise young stock; the wife and daughters are relieved from the burdens and cares of the milk. Cream is paid for in proportion to what it makes in butter; it is estimated by the inch and paid for by the pound. The new departure in the cream-

ery is to let the farmer skim his own milk; the collector measuring the cream with a rule in dimension-gathering pails, and credits them the number of inches taken. To test this cream a quart of cream from each patron is taken and churned by itself; allowing eight ounces of butter, standard, to the quart, we give the percentage of increase or shortage, as the case may be, and the book is shown to the patron each day, noting his cream of the preceding day, show him how his cream holds out or falls short of a pound to the inch. This is estimated by the inch and paid for by the pound, and is the only way patrons can receive their just dues. The creamery pays the farmer for value received, and is the most reliable plan to run a creamery. Buying cream by the inch has proved, by past experience, to be detrimental and an expensive way of doing business. It encourages farmers to be dishonest, and makes the honest farmer pay for the dishonesty of others. With the new process of buying cream at the farmer's door, the creamery business has become a satisfactory success; patrons receive the cash the first part of each month, for the cream, the preceding month, thereby enabling them to meet their debts and pay as they go. The result of this enterprise in our State has been to relieve all, or nearly all, of the farms from debt, and many (I may say a great many) farmers are loaners of money at the present time that were but a short time ago paying interest.

A cheese-buyer said to a writer in the Calumet, Wis., *News*, that ten years ago there was not one farmer in fifty, in Sheboygan county, who had $100 he could lend at any time. Now, says the cheese dealer, there is scarcely one out of the fifty who could not accommodate you with the amount any day. And this has all been accomplished through the dairying interest. The low price of wheat and barley never effects the price of cattle or cheese. It would have been much better for the farmers of this county this year had they given more attention to diarying and stock raising.

Not only this, but land became more productive, manure was utilized, more grass, more wheat, more corn, more oats were grown to the acre; farmers were encouraged, buildings were painted and occupied, and barns or stables were made warm and comfortable; the surroundings were beautified by shade and ornamental trees; fences were repaired and renewed; the good wife and daughter put on a smiling countenance; more time was devoted to reading and storing up knowledge; the farm journal was eagerly sought for by one and all. And, by the way, I can safely recommend your State paper, "*Colman's Rural World*" as a general farm paper. Its dairy department is valuable.

Now all of this has been accomplised within a few years, and what has been done for us can be done for you.

I may say more, your climate is beautiful, your soil is fertile and land is cheap.

Your country is naturally adapted to raising corn, grass, oats and all kinds of fodder for stock; winters are shorter and not so severe; your natural advantages far exceed ours; your home markets will consume all your products for many years to come.

It is much better to ship butter to the sea-board than corn, wheat or grain in bulk. It saves transportation by increasing the values and reducing the bulk. It takes several cars of corn to equal one of butter in value.

Dairy farming means mixed husbandry.

As a matter of fact, stock raising requires the farmer to produce grain, hay and fodder to provide for the comfort of his herd. The more stock kept on the farm, and the more grain, hay and fodder consumed the more productive the land will be, at the same time the valuation per acre will increase.

Winter darying is worthy of consideration, especially for your section. It is more advantageous for the cow to come in in the fall than spring. The spring milked cow may do her best but the flow of milk is not satisfactory, and as a rule she loses in condition, notwithstanding the extra feed she may be favored with, for grass is relaxing and a great change from dry hay. It is an undisputed fact that it is very difficult to hold the condition up in early spring, especially while giving milk and after being poorly wintered.

On the contrary, as a milker in the fall the cow has had a rest and is in good condition—change from grass to winter feed is more gradual. The extra feed she receives enables her to continue the flow of milk until spring. Turned to grass in good condition she increases the flow and thus continues until fall, giving her owner a larger flow of milk.

The demand for fresh made butter is increasing; peoples tastes are more fastidious, and we are educated to a higher standard. Consumers are willing to pay any price for choice, fresh-made goods, while streaked summer-made butter is a drug in the markets.

The old accustomed practice of making summer butter and holding for winter use is one of the things of the past. The dairyman must accommodate his mode of operations to the qualified tastes and interests of consumers. Until this is done the dairy interest of any State will be on the retrograde, non-paying plan.

Now, if we milk our cows nine months in the year, when is the best and most profitable time to have them come in?

We answer late in the fall or early winter.

Milk can be produced as cheaply, and much more profit realized by milking in the winter than in the summer months.

Prices of all dairy products are high through winters, we may say double that of summer.

More easily handled, greater safety, and more convenient in marketing, it saves losses in transportation through hot months.

Thousands of dollars are lost in this one thing alone.

It is a well authenticated fact, that any profitable enterprise that engages the attention of the business community many times is over done, and losses are sustained.

What will be the effect on prices of our dairy products if all should sustain this plan of winter dairying?

Prices would be more equalized; consumers would have their educated taste satisfied by having fresh articles of dairy food the year round at a fair price; the laborer, mechanic and the poorer classes could better afford to eat pure milk butter than they can now afford to eat bull butter, or any of the conglomerations of fat that are put upon our markets of the day.

The market prices would be reduced in winter and become higher in summer, at the same time give a good healthy profit to the dairyman the year round.

Mr. Walker, following the speaker, described the method pursued at the Tipton Creamery. This Creamery cost $5,000. Connected with it were six to eight acres of land, a fish pond and an ice house. For convenience, it was located at the corner of four roads. One man collected the cream, issuing tickets to the patrons certifying to the amount of cream taken at each gathering. The cream was measured by a Fairlamb can, each gauge of cream being rated at one pound of butter. He advised each patron in forming a Creamery to take some stock, and thus become identified with the interest and learn of its wants and the conditions its patrons should fill.

He would not advise beginning heavy, but to grow into it; not expecting immediate profits, but with patience awaiting the proper time for the system to be well organized. The stock of the Tipton factory is now at a premium. Along with this system of butter making, warm and clean quarters are needed for the cows.

Secretary Sanborn, by request, made some remarks:

1st. To show the greater profit of dairying than ordinary farming by crop sales.

2d. Its value indiversifying farming and increasing the fertility of the soil.

3d. The advantages of the creamery system over private dairy, and its several disadvantages, strongly favoring the creamery system because it gave more and better butter than the average community would make, and it relieved the household of its cares.

The speaker claimed that in favorable circumstances, as to ice, and markets, that an expert butter maker would not only make more and better butter, but would, with skill, sell it higher and make more money.

A running discussion was kept up that brought from various parties statements touching minor points favoring the creamery system.

The value of skim milk for a calf was very strongly urged. Deep setting of milk was approved of by all who spoke. The Fairlamb can was praised.

Dr. Laws suggested that much of the wealth of good farming rested upon attention to the seemingly little things of agriculture. He thought our people under-value the dairy interests.

Very much interest was manifested, and a movement put on foot to organize a factory at Higginsville.

At the close of these remarks, the meeting tendered the Board and invited speakers a vote of thanks: After which it adjourned *sine die*.

The sessions were well attended, and were actively participated in by those present, who manifested much interest, and thus gave the Board much encouragement to pursue the line of policy it has inaug urated.

After adjournment, stockmen present called upon the Secretary to give the address on "Stock feeding" announced in the programme.

The following address or talk was then given:

FACTORS IN ECONOMIC STOCK GROWTH.

The remark has been frequently made to me by stock growers that the free ranches were producing beef cattle so cheaply that the stock interests of Missouri were seriously suffering by the competition, and so far effected as to give occasion for a more diversified system of farming. The state of our markets cannot give rise to the views quoted, for on turning to them satisfactory prices are quoted, or at

least prices that compare very favorably with those of the past ten years. When live weight commands $6.50 per 100 pounds to $7.00 for the best, and in one or two cases $8.10 to $8.15 per 100 pounds live weight in Chicago, we have little opportunity to draw unfavorable comparisons with the past.

If it is a fact that the production of beef yields less profit than in the immediate past, it must be ascribed to enhanced cost. The advance in the price of land, the higher range of values for corn and even of "Roughness," and the great increase in cattle in the State from, in 1870—689,355 head to 1,410,507 in 1880, with the greater crowding of them in some sections, have undoubtedly had a tendency to increase the cost of beef. I apprehend that good stock managers will agree that scalawag cattle, or the poorer sorts, fed in bleak, open pastures with corn at 40 cents, and put upon a winter market at the rates such cattle obtain, will give no strongly alluring profits. I shall not attempt to show that the average of results fails to remunerate the average stock farmer under present conditions. It is evident that conditions have so far developed as to attract attention to necessities in stock raising not heretofore recognized as such. I may say at once that there is little doubt but what Missouri will continue to develop as one of the greatest of the profitable stockraising States up to and long after the free ranches, as such, have lapsed into history, a fate which they have already begun to realize.

It should, however, not require the stimulus of necessity to force us to recast our methods. Politic and aggressive management observes and adjusts itself to approaching developments and realizes upon results that taxes others. The question should not rest upon that of profit by present methods, but rather should resolve itself into one of whether there are better methods. It is not, is there now a profit, but how command the greatest profit? We should work our business for all it will realize.

In this plain talk, I shall confine myself to economic points in stock raising that have come under my notice during the several years that I have been giving attention to the subject in a special manner as an experimenter, and hope mainly to emphasize matters not unfamiliar and perhaps make a suggestion or two of some direct utility.

THE AVERAGE FARMER.

I desire it to be distinctly borne in mind that my remarks are directed in the interest of the average farmer. (I mean one who is tilling about the average sized farm.) Those who are carrying on extensive

operations will not expect some phases of my advice to be applicable to their circumstances. What constitutes the average farm, and what proportion does this class of farms bear to the whole number of our farms?

SIZE OF MISSOURI FARMS.

	Number of, 1880.	Number of, 1870.
Total number	215,575	148,328
Under 3 acres	122	691
3 and under 10 acres	3,460	10,113
10 and under 20 acres	8,647	17,431
20 and under 50 acres	43,786	55,988
50 and under 100 acres	58,030	38,595
100 and under 500 acres	97,359	24,898
500 and under 1,000 acres	3,536	514
Over 1,000 acres each	685	98

It seems, by the national census, that in 1870 eighty-two per cent. of our farms were less than 100 acres each, and by the census of 1880 fifty-two per cent. were less than 100 acres. More farms were held of sizes between 100 acres and 500 acres than between any other size. However, the range is very great, and unfortunately does not inform us of the number between 100 and 200 acres. Yet it does show that the number between 20 and 100 acres exceeds the number between 100 and 500 acres, and makes it probable that the great bulk of our farms are less than 160 acres in extent. Government statistics inform us that the average size of our farms for 1880 was 126 acres each; in 1870, 146 acres. I am induced to give the above figures for two reasons: First, because previous advocacy of painstaking methods and greater economy of our "Roughness," wasted now so liberally, has called forth criticism. The suggestion of adverse opinion was that the extensive operations of our big farmers would not admit of so close an economic system of management as detailed. The statistics quoted show that the great body of our farmers are either small farmers, or are managing only medium sized farms, farms of dimensions that readily admit of careful and "Intensive" methods. A more pointed and significant state of affairs, revealing the drift of our agriculture, is seen in the fact of a decrease in the size of farms from 1870 to 1880. These facts are not alone prophetic of a change from the old skinning process, but historically mark the beginning of a change radical in type and that is to assume broad dimensions.

PRESENT METHODS.

The present methods of stockraising consist of the use of a cow selected without reference to milking quality for the sole purpose of producing a calf, being dried off with the weaning of the calf; of an improper selection, or want of selection, in a majority of cases, of breeding animals; of feeding stock in the open air with free access to unhoused food; of, in too large a proportion of cases, grazing wild grasses; of negligent and wasteful feeding off of corn fodder from the spot of growth; of winter fattening on whole corn; of the almost complete waste of the manure produced; of marketing at four years of age.

These methods have arisen under conditions that afford strong apologies for them, if indeed they do not justify them. We now are to square our methods by present exigencies, and nothing will be risked in affirming that more "Intensive" methods are demanded. All of the old conditions named can not now be reviewed, but I shall touch upon most of them in advocating the growth of the well bred beast (from a mother whose milk is devoted to dairy products), turned from the pasture to the market, early matured upon ground concentrated foods and housed hay and corn fodder to be fed to the protected beast in proper combinations, and the manure therefrom carefully saved and treated as a part of the income of the herd, or put to the credit of the beast.

GOOD STEER NEEDED.

I quote the following from my remarks before the Board of Agriculture of another State, covering results of personal trials:

January 13, lot 1, weighed 2,038 pounds; feed timothy hay and corn meal.

January 13, lot 2, weighed 2,065; feed timothy hay and no grain.

Lot 1, ate in fifty-six days, 2,172 pounds of hay and 446 pounds meal.

Lot 2, ate in fifty-six days, 2,502 pounds of hay and no grain.

Lot 1 gained sixty five pounds; lot 2 lost 12 pounds.

Change of food, lot 1 on food of lot 2, and lot 2 on food of lot 1.

Lot 1 gained on 2,725 pounds of hay for fifty-six days, 113 pounds.

Lot 2 gained on 2,145 pounds of hay for fifty-six days, 117 pounds.

In first period 446 pounds meal took the place of 330 pounds hay. In the second period 500 pounds meal took the place of 580 pounds of hay. In both periods lot 1 ate the most. It will be seen that lot 1, in first period, while eating 330 pounds less of hay than lot 2, ate 446 pounds of meal in its place. While in second period lot 2 ate 580 pounds

less of hay and only 500 pounds meal to make it up, and in neither period made as good use of food as lot 1. One lot used the excess meal given to take the place of a cheaper food, using enough less of the hay to correspond approximately to the nutritive value of the meal. The other lot used the excess meal given to a much larger degree as excess food. In short, here is a practical illustration of the fact that the assimilative and digestive organs of the one lot could use to better advantage larger rations than the other. From thousands of weighings of milk flow under changing and increased diet, further illustrations might be drawn of the fact that the functional limit of capacity to digest and assimilate food varies. It is well known that a cow that has a low capacity for milk flow will, under an increased diet, turn the increased food given to the production of fat rather than excess of milk, while a cow with good capacity for milk flow will use the excess food for the increase of the milk flow. The time, in the history of breeding has come when the male used should be tested in relation to the economy with which he disposes of his food. A breeder who has several bull calves can easily determine, by test, which one consumes, digests and assimilates the most food. Under good management only about 12 per cent. of the food given goes into actual gain of weight. This amount thus made available can undoubtedly be increased by the method alluded to. Whoever carries out the work and offers for sale a line of stock of tested and superior merit, giving the maximum gain per pound of food, will do a work of as much value to the world as Colling's was. While most farmers rely upon a few breeders to carry up the standard of excellence, too few of us avail ourselves of the results of their labors. The experiment quoted is offered as an inducement to better breeding as the starting point to more successful feeding. I find that the stock of many farmers and often of whole sections is not worth one-half of that of their neighbors' cattle or cattle of neighboring sections of the same age and on a beef basis.

THE COW FOR BUTTER AND CALF.

As now managed, the cow brings no revenue, but the calf consumes much more than the steer at his average weight, and stands, through his mother, in the way of the profit that might have been realized from about one and one-half steers at their average weight from calfhood to slaughter. From this standpoint the cost of the calf becomes a serious obstacle to the profitable production of beef from him. This cost, for the locality of Columbia, may be rated as follows:

Interest and risk on cow, $5.00; wintering, one and one-half tons hay at $5 per ton—$7.50; pasturing, eight months, $8. If a profit of $5 is asked on the cow, the calf then costs $25.50, aside from care of cow, salting, etc., which will bring it up to $30 very nearly. It will cost less at many other points. For permanently profitable production of beef this cost must, on high priced land, and can be cut down by converting the milk or fat of the milk into butter and rearing the calf on skim milk. That good calves can be thus raised is no longer problematical. I have had a skim milk calf weigh 400 pounds at four months of age, and for years have had the calves under my charge reared upon skim milk. At three days of age the calf is weaned from the cow and gradually weaned from new milk until at three weeks of age, or before, skim milk alone is given. In this skim milk, at first in spoonful amounts, is added boiled flax seed. On account of its cost and loosening qualities but little of this is ever given, and is given to replace the fat skimmed from the milk. As the calf increases in age, first shipstuff, or oat meal, or both, and then as the flax seed meal is withdrawn, either linseed or cotton seed meal is added with perhaps a little corn meal. A small amount of bone dust will be found useful at this period. The milk is warmed to about blood heat and increased with the age of the calf up to eight to ten quarts per day. The meal begins with a spoonful and increases to three pounds per day at two months of age. Grass or forage crops being added as the calf will take them with what of dry and soft hay it will eat. By this means $40 in butter and the skim milk for the calf should be attained, plus a good calf. After the accumulation of some skill in dairying, with the selection of good cows, I am confident that the cost of our beef would become less.

EARLY MATURITY.

Early beef is cheap beef. The law that holds the members of the universe in their harmonious courses, making "the music of spheres" is no more unalterable than the law that the older or larger an animal grows the more food it requires to produce a pound of growth. In demonstration of this fact I could quote facts, not theories, sufficient to fill a small volume and establishing unquestionably the truth of the assertion. Perhaps no more costly defiance of this law is found than in the practice of keeping our swine until about eighteen months of age, carrying them, uselessly, through an unnecessary winter's keep with the drawback of its cold and chilling storms. Brevity on each point is necessary in the wide field under review in a brief article hence I will quote, in confirmation of assertions, remarks elsewhere made from personal experience. "In three experiments, covering

from sixteen to fifty-nine days, I found that calves weighing 425 pounds ate 3.3 per cent. of live weight daily, and required 10 pounds of hay to make one pound of growth. With younger calves 7.7 pounds of hay had given one of growth. With cattle averaging 750 pounds weight 2.6 per cent. of live weight in hay was daily consumed, an average of five experiments, and 19½ pounds of hay were required for one pound of growth. With steers weighing 1,000 to 1,100 pounds in eight trials 2.16 per cent. of hay was consumed daily and 26 pounds were required for one of growth. The above lot were fed upon timothy hay and at each age made a growth of about one pound each, as an average on hay alone, in the winter season. I fed two calves for five periods of two weeks each, (in connection with what is said under rearing calves with skim milk this trial will have interest). December 16 to 30, gained 63 pounds on 20 quarts skim milk and one pound meal; December 30 to January 13, gained 59 pounds, ate 18 quarts skim milk, two pounds meal and four pounds hay; January 13 to 27, gained 71 pounds, ate 20 quarts skim milk, two pounds meal and five and one-half pounds of hay; February 10 had gained 60 pounds, ate two pounds meal and seven pounds hay daily; February 24, had gained 63 pounds and eaten daily 20 quarts skim milk, three pounds grain and 10 pounds hay. In this brief period it has required two pounds grain and 10 pounds more of hay for the same growth. With pigs the growth of a pound required at first nine and one-half quarts skim milk, then 12 and at last 15 quarts, when weighing nearly enough for market, or less than 200 pounds. An increased ration follows an increased weight of swine, irrespective of age, to some extent. This fact, to some extent, has been overlooked by most. Yet, early maturity is still essential, as the following facts will show: "We sell a steer, say at 1,500 pounds weight, the average gain weight, after calf is born, is about 800 pounds. The 1,500 pounds can be made in two winters and three summers, or in two and one-half years. Suppose it is made in four and one-half years, as is often the case, then it has eaten maintenance fodder for two years longer than necessary. I find that it requires 14 pounds of hay daily to maintain the existence of a steer weighing 800 pounds, without gain or loss. This is called the food of support. This tax must be paid to run the machine without work, and lasts as long as the steer exists. We lose, then, this food of support, or 14 pounds daily for two years of unnecessary life in which to attain the 1,500 pound's weight." For two winters it amounts to two tons of hay and the cost of care and interest; also, we lose two summers' care and pasturage. The same truth prevails with the pig. It is unnecessary

to dwell upon an obvious law once stated. Candor compels me to state that this, like other laws, may be true and yet not necessarily advisable to follow. The exception does not in this case completly overthrow the law, but modifies its value. Certainly we cannot depend upon a pound of growth for 16 pounds of hay on our average 800 pound steer. This, at $5 per ton and cost of feeding, will give us no less than five cents a pound, for growth, in cost. My experience is, that winter feeding costs more, while summer feeding on good pastures should give an easy two pounds growth per day at a cost varying from one to two cents a pound for a pound of growth, according to circumstances. The costly winter feeding of grain, required for maturity at two years of age, quite compensates the extra cost of another year's keep for the same weight, where lands and coarse food are cheap. If any one is curious, or in a business way anxious, to know how the balance sheet of the two practices will come out for their own local prices, I refer them to the figures of amounts eaten at varying weights already given, and from those and rating two pounds of corn equivalent to three of timothy, using local prices of pasturing, and approximately just results will be obtained. I have data that bear on the question, but space forbids their use. Where land and materials have the values attained in many sections of Missouri, I recommend early maturity. I compromise between the contending conditions and turn the steer from pasture the third summer for beef, using two winters only. While we may not all of us be prepared to push early maturity to extremes, there can be no doubt but what a recognition of the law involved will cheapen the cost of beef to the larger proportion of our feeders.

SHELTER.

Will it pay? It is a brutal feeling that, in the balance over against suffering, sets off so much coin and rates it as gain. He who propagates suffering brutalizes himself. In approaching this division of my subject I waive the humanitarian side of it save the assertion that whatever tends to prevent suffering in our stock most obviously aids in making the food more effective. Care and kindness is a cash commodity in stock management. A barn will serve a three-fold purpose, protecting fodder, cattle and manure. For our average farmer of 126 acres it will shelter (a $1,500 barn) his needed fifty head of cattle, 100 tons of fodder and manure therefrom. Its annual cost will be $150. We now know that rains reduce the weight of fodder, that they saturate it according to circumstances from five per cent. up to twenty-five per cent. Our round stacks of two tons, by a well known mathematical law, present

on the outer part of their circumference a very heavy proportion of the entire stack. This alternately is wet and dry and reduces in weight and value. Again, it is now beginning to be understood that stored foods, even in barns, lose weight aside from water contents. I have thought (an opinion I propose to verify or disprove) that stacks in open air undergo a very heavy loss judged by those moved by the farmer. Rating the unnecessary loss at twenty per cent. we lose twenty tons, which at $5 per ton, rounds out $100 of the $150 annual cost of barn. The loss in feeding around stacks of hay, by treading out, is very considerable and will pay the balance standing against the barn. Further along I shall show that the corn fodder, now well nigh wasted, can, by proper management, be nearly or quite all saved in a barn.

Secondly, the manure through the cellar can be nearly all saved. It would be infatuation to set up the claim that the average farmer is not interested in this matter, when he has lived to behold the period when Missouri raises but 13 bushels of wheat per acre and often sees her corn crop below 30 bushels, and has seen it below 20 bushels per acre, and the State on a declining yield. Let us make no mistake about this interest. We have arrived at a period when cattle husbandry has become a necessity. We are now to keep cattle to save the farm and are not to look upon the farm as a means of keeping cattle, and for the sole purpose of direct profit. Every 50 bushels of corn, with its fodder removed, from an acre of ground, carries from it 64 pounds of nitrogen, 77 pounds of potash and 31 pounds of phos. acid. Do these amounts look insignificant? By their use I have increased the yield over the natural yield of the soil without fertilizers 35 bushels per acre. Several States, or the farmers of them, are using these materials at the rate of millions of dollars annually per State. This movement has reached the eastern borders of the Mississippi, and indeed one firm informs me that they have sold 80 tons yearly in this State. What do these materials cost? Nitrogen, 22 cents per pound; phos. acid, 10 cents and potash 4 cents, or to produce 25 bushels of wheat with its straw, $12.08. We have been squandering in a few brief years the gift of the ages in soil fatness. Our drafts are now honored with reluctance and we are admonished that deposits must be made. Extensive experience and observation enables me to speak with some confidence in this matter. We shall find stock farming our cheapest method of permanently increasing the fertility of the soil, and barns and cellars, or protection for manure, a necessity of the situation. The philosophy and practice of saving, preparing and applying manure, are too full to enter into. To give definiteness to this factor I will note that the manure made from consuming 100 tons of hay will meas-

ure from 80 to 100 cords, and sells in the East, for ordinary farming, for from $4 to $7 per ton. As the manure is now made in the State very little becomes practically available. A credit must be placed to shelter for manure saved.

Thirdly, less food is eaten and better growth made from a pound of food when fed in quarters where water never freezes. The belief is current that man and animals consume more food in the winter than in the summer. The immense eating capacity of the Esquimaux, the better appetites of animals and man in winter are popular illustrations of facts upon which this belief is founded. Chemical physiology teaches us that in cold weather more heat is lost from the body by convection or by radiation from the body into the air and that more food is required, therefore, to maintain the standard temperature of the body. In this respect the animal, much resembles a stove, which in cold weather requires more fuel to maintain a given temperature, although the analogy is not complete. General facts, apparently demonstrative of the correctness of the prevailing conviction, might be massed in tiresome abundance. Facts specific are far more important than plausible deductions from general truths. Farming is suffering more from a redundancy of views and a paucity of facts than any other calling. It is the oldest greyhead of the industrial ages and the youngest babe in positive knowledge. For several years I weighed the milk accurately night and morning of several cows. I found that the milk flow rose and fell with the rise and fall of the mercury in a thermometer, whose record, likewise, was kept night and morning. These cows, under trial, were kept in a new, warmly constructed barn. The decline of milk flow was in direct ratio to the degree and length of time of duration of the cold spell. When the weather grew warmer the milk flow increased. January 4 to 7, 1877, temperature 13 deg. below zero, and milk flow 3.4 per cent. less than for next three days with temperature 11 deg. above zero. Average temperature of January, 2.5 deg. above zero; average yield, 64.3 pounds. Temperature of February, average 11 deg. above zero; yield of milk, 70.1 pounds, or nine per cent. more, when naturally, by longer continuance of milking, the cows should have given less. In 1878, January 18 to 28, yield 880 pounds; temperature one deg. above zero; January 29 to February 7, yield 800 pounds; temperature 10 deg. below zero; loss, 10 per cent. I might multiply these data, given for illustration. Did the cows consume more in these cold days? A winter's work was devoted to this question. In the barn above mentioned quarters were ceiled up warmer than the main barn and a lot of cows put in them and a lot left in the old and usual stalls. In the ceiled stalls, which were ventilated, the average

temperature was for over three months 45.1 deg.; in the open s'alls it was about 32 deg. on average. The cows were exchanged places about once a month, the results always favoring the lot in the warmer quarters. In these trials of temperature, milk flow, weight of cow's butter product and food eaten, were all taken, involving upwards of a thousand weighings. There was no element of guess. Omitting the figures I give the results, which show a saving per cow of 2.8 per cent. in milk flow and 1.7 pounds of hay and corn fodder. Milk at three cents per quart, corn fodder at $6 per ton and hay $12 (prices when the trial was made), the saving for 120 days amounted to $1.60 each. This was between two sections of a barn, and not between the barn and raw outdoor weather, with sleet and driving winds. We know that moving air cools the body much faster than still air, as in a barn.

To show the sensitiveness of animals to conditions under which they are kept, I quote from the results of an elaborate trial of carded steers against uncarded. I found, first, that in cold weather that carded steers gained less than uncarded, but quite as well in warmer April; and, secondly, that a carded steer ate 1½ pounds more hay. The air got freer access to the carded steer. Since the above experiments Prof. Shelton, of the Kansas Agricultural College, has tested feeding housed against unhoused pigs, with results favoring, as above, the sheltered animals. Shelter, then, is a demonstrated success in economizing food and encouraging growth. I know that it involves some extra labor, but can we doubt but what our average farmer will find the sum of the savings named, under shelter and by it, profitable, enabling him to cheapen the cost of beef.

FEEDING, A SCIENCE.

I shall enclose, in quotation marks, a brief outline of the principles involved in animal nutrition as abstracted from a lecture by the writer before the Massachusetts Board of Agriculture, believing that such a review will not be entirely useless and uninteresting, although not wholly applicable to our conditions, and then endeavor to show that a collossal waste of valuable animal food is annually made in Missouri:

"Farming may have some truths of universal exceptance that are axiomatic in their nature, but principles of general acceptance it has few or none, yet laws undeviating govern in each department of husbandry. I feel confident that if the known laws and accumulating facts that bear upon animal growth and nutrition were applied in Massachusetts, the annual saving would rise above a million dollars. Excusing myself from a methodical discussion of the subject, I propose to review some of the laws of animal growth and nutrition, and state

facts, accumulated from personal work and the work of others, that bear directly upon economical animal growth.

For my purpose, a review of some fundamental facts, for those who are not familiar with them, will be both suggestive and important.

	Lean Ox.	Fat Ox.	Fat Calf	Fat Pig.
Fat	7.1	26.80	18.10	40 20
Proteine	15.8	13.70	15.30	11.00
Ash	—	3.90	4.50	1.80
Water	—	48.60	60.19	42.00
Phosphoric acid	—	1.56	1.64	.73
Lime	—	1.74	1.93	.77

The above table reveals facts in part commonly understood, and suggests the inquiry whether the calf, containing more proteine that fat, needs to be fed like the ox, containing twice the amount of fat than it has of proteine. The proportion of phosphoric acid and lime, of fat and proteine, to the water of the calf, indicates the progressive changes it must undergo before the period of maturity; and the difference between the calf and the lean ox or the pig leads us to the conclusion that animals so unlike should not be fed alike, and that the same animals should be nourished differently at varying stages of growth. A mature animal is making neither proteine nor fat, but maintaining the action of digestive and vital organs and heat of body only. Again, we have the butter-cow and ox at work, the growing steer and the fattening steer. These considerations show that feeding is a complex science, requiring skill of a high order.

COMPOSITION OF FOODS.

If it is true that animals kept for diverse purposes, or those of differing stages of maturity, require varying proportions of fat, proteine, etc. Can these materials, in practice, be given in the specific amounts desired?"

The following tables are quoted from German experimenters through Prof. Goessman, and are the result of actual tests with cattle, sheep or hogs, fed in costly respiration chambers, or stalls, involving years of intelligent and laborious work.

Table one represents simply analyses of German foods. American foods vary somewhat from German foods. Our grasses are less rich in albuminoids and fibre and richer in carbhydrates. The Board report

for 1882 shows analyses of American foods, to which I refer those interested. I give the German tables of analyses because the feeding trials were made with them, no digestion trial having been made in America:

ANALYSIS OF FOODS.

	Albuminoids.	Fats.	Corbohydrates.	Woody Fibre.
Meadow hay	9.5 per ct.	2.3 per ct.	40.3 per ct.	27.1 per ct.
Rowen	11.7 "	3.1 "	42.3 "	22 0 "
Clover hay	11 0 "	3.2 "	32 9 "	29.9 "
Leucerne	14.4 "	2.5 "	27.9 "	33.0 "
Wheat straw	3 1 "	1.2 "	37.5 "	40 0 "
Oat straw	4.0 "	2 0 "	35.6 "	39.7 "
Barley straw	3.4 "	1.4 "	34 7 "	41.8 "
Oats	12.0 "	6.0 "	56.6 "	9.0 "
Barley	11.2 "	2.1 "	65 5 "	5.2 "
Corn	10 6 "	6.5 "	65.7 "	2 8 "
Beans	25.1 "	1 6 "	46.7 "	9.4 "
Peas	22.4 "	3.0 "	52.6 "	6.4 "
Cotton seed cake	28.5 "	6.6 "	32.0 "	21 1 "
Linseed cake	29.5 "	10 0 "	29.8 "	9.7 "
Wheat bran	14.5 "	3.5 "	53 6 "	9.4 "
Skimmed milk (sour)	3.5 "	.7 "	5.0 "	.....

The cotton seed cake is very much poorer in albuminoids than the average American cotton seed meal. I have had samples giving 489 degrees of albuminoids. Our corn is richer in albuminoids about 12 per cent.

TABLE 2.—DIGESTIBILITY OF FODDER PLANTS PER CENT.

	Albuminoids.	Fats.	Carbohydrates.	Fibre.
Meadow hay	57	46	63	58
Clover hay	60	59	69	47
Leuceme	77	89	65	40
Wheat straw	26	27	40	52
Oat straw	38	30	42	61
Barley (poor quality straw)	15	38	51	52
Oats	74	82	73	21
Barley	77	100	87	20
Corn (tested on pigs)	85	76	94	34
Beans	90	97	94	63
Peas (tested on pigs)	88	58	98	74
Cotton seed cake	74	91	46	23
Linseed cake	87	91	91	26
Wheat bran	88	80	80	20
Skimmed milk	96	95	99	.....

"From the above table of amounts digested, (for it is only the amounts digested that are given a value in feeding,) it is seen that any desired amount of proteine can be supplied with the coarser foods. Thus, if corn-meal given to a calf fails to furnish the desired amount, barley, linseed, or cotton seed would replace it to advantage.

Proteine, or albuminoids, finds its distinctive function in construction of muscle, (lean meat,) tendons, ligaments, and cartilage. No other portions of a food can fill its place, as they are devoid of nitrogen. Proteine forms fat, may support heat in case of necessity, and is assumed by many physiologists to be the source of force. The chief function of carbohydrates is to maintain the heat of the body. This is contended by many, with much show of reason, to be the source of force, and a possible source of fat, and in some animals a certain source of fat. The fats of food have their distinctive field in fat formation, but may be a source of heat, and possibly of force. The minerals, or ash, are the basis of the bony frame-work, and have other offices in animal organization. Time will forbid a consideration of this part of the question. I will simply add, that I have found it essential, especially with pigs, to add some source of lime to the food given.

The science of feeding, then, consists, not merely in giving hay or grain, but in furnishing the requisite amount of proteine, carbohydrates, fats, and ash, daily, in amounts sufficient for the growth of the animal, or the purpose for which it is kept. With this view, hay cannot be looked upon as a perfect animal food; for, while the maturing animal changes at each period its relative demand for proteine, etc., that of the hay remains fixed. I will give the following table, and illustrate.

The Germans recommend, from their experiments, the following amounts, daily:

	Proteine.	Carbohydrates.	Fats.	Ratio.
	lbs.	lbs.	lbs.	
Ox at rest	.7	8 0	.15	1 to 12
Ox at hard work	2 4	13.2	.50	1 to 6
Milch cow	2.5	12.5	.40	1 to 5 4
Fattening oxen first period	2.5	15.0	.50	
Growing cattle from two to three months old, (weight 150 pounds)	.6	2.1	.30	1 to 4.7
Growing cattle from three to six months old, (weight 300 pounds)	1.0	4.1	.80	1 to 5
Growing cattle from six to twelve months old, (weight 500 pounds)	1.8	6.8	.30	1 to 6
Growing cattle from twelve to eighteen months old, (weight 700 pounds)	I.4	9.1	.28	1 to 7
Growing cattle from eighteen to twenty-four months old, (weight 850 pounds)	1.4	10.8	.26	1 to 8
Growing cattle from two to three months old, (weight 150 pounds) per 1,000 pounds live weight	4.0	13.8	2.00	
Growing cattle from three to six months old, (weight 300 pounds) per 1,000 pounds	3.2	13.5	1.00	
Growing cattle from six to twelve months old, (weight 500 pounds) per 1,000 pounds	2 5	13 5	.60	
Growing cattle from twelve to eighteen months old, (weight 700 pound) per 1,000 pounds	2.0	13.0	.40	
Growing cattle from eighteen to twenty-four months old, (weight 850 pounds) per 1,000 pounds	1.6	12.0	.30	

I find, as the result of much weighing, that seven steers, weighing 500 pounds each, will consume, in round numbers, a 100 pounds of such Timothy hay as we raise on our College Farm. By the table it will be seen that these steers need nine pounds and one-tenth of proteine daily, and 47 pounds and six-tenths carbohydrates. Our hay furnishes, by Professor Collier's analysis of it, five pounds and four-tenths digestable proteine, and 45.5 pounds carbohydrates, which shows a lack of a small per cent. of the requisite amount of the latter, and a very heavy one of the former. How shall the amount said by the Germans to be desired be filled? The great food of the east has been corn meal. If now, to the hay ration, 25 pounds of corn meal is added, about 80 pounds only of hay will be eaten, and then we will have the sum of 5.86 pounds proteine and 52.11 pounds of carbohydrates eaten; an excess of the latter, and still a heavy deficiency of the former. We have given a corbonaceous where a nitrogenous (proteine) food was needed. Looking down the table, we find cotton seed meal rich in proteine, and using it, we find that but little over half of the quantity used in corn meal with a lessened amount of hay eaten by its use, will give the requisite amount of proteine, and very closely to the desired amount of carbohydrates.

In practice, I find that a hay ration alone gives me a growth, in average cases, of a pound a day; certainly not a full nor a desirable growth. By the addition of corn meal to a hay ration for growing steers, I have found less hay to be eaten by nearly the weight of corn meal given, but, owing to the superior richness of corn meal in digestable carbohydrates, an excess of carbohydrates has been eaten, and the slight increase of albuminoids or proteine in the ration, has been followed by only a moderate increase of growth, and yet less than desirable. These facts, coupled with the deductions of German investigators, as shown by the last table, leads to the following statements of some of the accepted facts in the new science of feeding :

The first is virtually a repetition of what has already been stated; the object for which an animal is kept cannot be best attained unless a proper proportion of each of the constituents of a complete food is daily given.

Again, the most economical use of a food cannot be made where, although enough of each constituent is given, there is an excess of one, for that which is fed in excess is mainly thrown off in the waste of the system. It would be bad practice to add to a food already over rich in albuminoids another food, relatively rich in the same constituent. It will thus be seen that clover hay for a growing steer of 850 pounds would not be so appropriately supplemented by cotton seed meal as by corn meal.

The relative value of a food when fed alone, as determined by German tests, is measured largely by the relative digestible amount of the deficient material present. Thus, if enough of a given food were consumed to furnish all the minerals, fats, and carbohydrates needed for the most rapid growth, and yet containing only one-half of the needed amount of albuminoids, no continuous rapid growth would be possible; economy would demand the addition to it of an albuminous food.

The reason why the coarser foods, so common with us, straw, corn-fodder and swale hay, are so lightly esteemed, is due to the deficiency of albuminoids. The value of these coarse foods can be greatly enhanced by the addition of albuminous meals.

Looking down the table of amounts of albuminoids required for growing animals, it is noticed that a calf, in proportion to weight, requires twice the amount of albuminoids, daily, that is needed by a seven-hundred-pound animal. Again, looking down the table of amounts of nutrients digested in a hundred pounds of the various foods given, it will be seen that oat-straw, swale-hay, etc., are poorer in albuminoids than good hay; yet it is a popular belief that young

animals will thrive better with poor foods than older animals. This belief is carried out in practice. The ratio of low-meadow hay in the table is one pound of digestible albuminoids to eleven pounds. The ox at rest only requires from one to twelve pounds; the eight-hundred-and-fifty-pound steer, from one to eight; while the calf needs from one to four and seven-tenths. Even the hay richest in albuminoids falls short of this material in sufficiency for the calf. This policy of feeding poor foods to young animals, without appropriate grain, should be reversed in the interest of economy. Farmers frequently assert that they know that their young animals do better on the poorer foods, eating it better than their older animals. This is perhaps true, and is due to the fact that young animals have a vigorous appetite, consuming more, and gaining more, in proportion to weight, than older ones. At the growing period it is a great mistake to rely upon a vigorous appetite to utilize inappropriate food; it is a sacrifice instead of economy. I have known instances where a half truth had been mastered, and with the poor foods albuminous grains or meals have been fed, but in amounts to correspond with the weight of the animal. In practice, we cannot bring our methods to scientific accuracy for various reasons; and it is a sufficient approximation in practice to say, that if one was feeding calves, yearlings, two-year-olds, and three-year-olds, with one meal to supplement a coarse food, each animal would require substantially the same amount. As an illustration, I find in practice, that in round numbers, eleven calves, weighing 300 pounds each, will consume 100 pounds of timothy hay. They would require 10.56 pounds digestible albuminoids, while the hay will furnish but about 4¼ pounds, making a deficiency per calf of 56 100 pounds daily. I find that five 850 pounds steers will consume a little over 100 pounds of hay daily. These five require, daily, eight pounds digestible albuminoids, but get in the hay only a little over 4¼ pounds or a deficiency of 54-100 pounds each. I find on account of their vigorous appetites, and for other reasons to be named, that it is desirable to feed our young stock as well as older animals on straw, corn-fodder, or poor hay, but so long as they are kept for growth, always accompany such ration by an amount of grain quite uniform at varrying ages.

I do not wish it understood from my quotations that I endorse fully the German tables. In the lecture quoted and elsewhere I have given quite fully my objections to some of their premises and necessarily to their conclusions. Those objections I base upon careful personal feeding trials with analyzed foods. I need not recount them here. I have quoted only of matters that I especially object to in the tables of amounts of constituents needed daily. There I maintain

they have called for more protein than is needed. How much more I am unable to say, but, perhaps, roughly speaking, 25 per cent. I will now quote from some trials while at the New Hampshire Agricultural College facts that show that coarse foods deficient in carbohydrates are made valuable by adding small amounts of concentrated albuminous foods, and after these quotations facts attained at our own Missouri Agricultural College.

TRIALS AT NEW HAMPSHIRE AGRICULTURAL COLLEGE.

Lots.	Time in Feeding.....	Foods Given.....	Amount of Food.....	Digestible Albuminoids.....	Digestible Carbo-hydrates.....	Digestible Fats.....	Ratio of Albuminoids to Carbo-hydrates.	Gain.....	Cost of Food for Seventy Days.....	Value of Straw compared with Hay as Result.....	Value of Swale Hay compared with Good.....	Manure Value.....
	Days.		lbs.	lbs.	lbs.	lbs.		lbs.			pr. ct	
1	70	Swale hay.	2496	79.87	1239	31.20	1 to 5.1	167	$15.04	.....	86	$12.80
		C. S. meal.	560	207.00	74	49.00						
2	70	Good hay.	3536	146.00	1803	34.00	1 to 12 9	185	21.21	.....	.....	11.36
3	70	Straw.	2423	34.00	971	17.00	1 to 21.3	120	9.53	1.26	.....	4.60
		Corn meal.	347	25.00	237	9.00						
4	70	Oat straw.	2310	31.00	926	16.00	1 to 6.3	81	12.74	.96	.....	8.60
		Meat scraps.	280	134.00	.....	11.00						
		Corn meal.	67	5.00	46	1.70						
5	70	Oat straw.	2450	34.00	982	17.00	1 to 5.8	133	13.88	0	.....	9.08
		Blood.	280	151.00	.....	1.40						
		Corn meal.	146	11.00	100	3.70						
6*	77	Clover rowen.	1694	118.00	645	20.00	1 to 9.1	144	12.21	1.65	.....	10.55
		Oat straw.	1309	18 00	525	9.00						
7	56	Clover rowen	1400	98.00	533	17.00	1 to 8.4	120	5.60	3.00	.....	6.79
		Oat straw.	840	12 00	337	6.00						
8	70	Good hay.	3266	135.00	1666	32.00	1 to 12.9	63	19.59	.....	.....	10.49
9	70	Good hay.	2688	111.00	1118	26.00	1 to 10.5	114	22.03	.....	.....	10.61
		Meal.	591	43.00	403	15.00						

*Average of several trials of lots of from two to six steers in periods of from twenty-one to seventy-seven days.

PRICES OF FOODS IN THE ABOVE TABLE.

Meat scraps and dried meat, $45 per ton; dried blood, $45 per ton; straw, $5 per ton; corn meal, $20 per ton; good hay, $12 per ton; clover hay, $12 per ton; swale hay, $6 per ton.

The above prices are eastern and some of the foods out of our reach, yet the principle involved of combination of albuminous foods with carbonaceous, receives just as good an illustration. The clover hay is a food open to the use of us all. It will be observed by a previous trial that clover hay is much richer in albuminoids than good meadow hay, and is, therefore, well-fitted to feed with straw and corn fodder.

Feeders may regard the gains as too small to give the figures value. It must be remembered that the above is an experiment to ascertain the value of combination foods where albuminous foods are made to supplement foods deficient in albuminoids, and hence it was thought better to feed limited amounts of concentrated foods.

1879.—For Forty-Nine Days.

Lot.	Feed.	Gain per day.	Cost per day.
		lbs.	
1	Timothy hay 46 pounds	1.40	$0.463
4	Straw 26 pounds, fish 2 pounds, and 1 pound corn-meal each	2.75	.260

1880.—For Forty-Nine Days.

Lot.	Feed.	Gain per day.	Cost per day.
		lbs.	
1	Timothy hay 43 pounds	1.41	$0.430
2	Straw 22 8 pounds	(Loss.)	.114
3	Straw 19.2 pounds, and 3 pounds each new process linseed meal	.87	.192
4	Straw 19 2 pounds, and 3 pounds each bran	.92	.171
7	Straw 19.3 pounds, and 3 pounds cotton seed meal	2 75	.182
8	Straw 16.6 pounds, and 3 pounds each mixed meals	1 25	.165

Corn-fodder has also beeen tried quite extensively with favorable results. While the above figures may be safely left to tell their own story of economy, yet there are several facts that it suggests to which I wish to call attention.

First, several of the combination of straw and grain gave as good growth as the timothy ration; and the straw is made, by the combined ration, as valuable as the hay. Take, for illustration, the fish ration: it gave better growth than the hay to the lot by its side. The fish and

corn-meal in this ration cost thirteen cents. If we subtract this cost from the cost of the timothy to lot one, or forty-three cents, we have thirty cents; or it seems that twenty-six pounds of straw, then, did better business with the fish, and netted thirty cents, as a substitute for hay. In many trials with clover and oat-straw, I have universally got as good results from clover and straw combined as from timothy alone: in other words, either straw is worth as much as hay in the ration, or clover is a better food than hay. The real truth of the matter is, both foods are worth very much more when fed together than either would be fed alone: at least, such has been the case with us at the College Farm. They are foods complimentary to each other; and each prevents the waste of certain materials in the other, if it were fed alone. Clover is rich in albuminoids, and less so in carbohydrates than straw; while straw is poor in albumoinids.

Millions are annually wasted in New England from the hasty acceptance of palatableness as a measure of food-values. The figures given illustrate this. In 1880 lot one ate 43 pounds of timothy, and made a gain, while lot two ate but twenty-two pounds and eight-tenths straw, and returned a loss. This is no evidence that straw is good for nothing as a food, but is evidence that 22 pounds and eight-tenths of straw is not worth as much as 43 pounds of hay.

From what has already been said, it will be seen that two steers, weighing 1,700 pounds, eat 30 pounds of hay daily for mere maintenance; and, had lot No. 1 received but 22 pounds and eight-tenths of hay, they, too, would have lost weight. But would that have been an evidence that hay is good for nothing but bedding? The truth is, that oat-straw, swale-hay, and like foods, have been sadly underestimated, not merely because of their deficiency in albuminoids, nor because of indigestibility, so much as from the fact that they are unpalatable, and hence not eaten in amounts sufficient for growth. Whenever, by skill, the feeder gets them eaten, they each of them, to the extent eaten, become nearly as valuable as timothy hay. This same mistake in regard to palatableness has led us into other mistakes.

Again, I repeat, that these are eastern figures, but teach the moral exactly as well for us. While we have not fish to feed, we have choice of several albuminous foods made use of by me in the constant trials for six years. Linseed meal, bran, shipstuff and clover hay; the latter I have invariably found to be a most valuable food to give with straw, and available to all of us in profusion. A pound of straw, or of corn fodder, and a pound of clover hay are as valuable as two pounds of timothy.

TRIALS AT MISSOURI AGRICULTURAL COLLEGE.

I selected five lots of steers of like ages and weights, the age being two years. The hay, grain, and water part of the time, was weighed daily. I will note the results then arrived at, as expressed in these conclusions of the Bulletin that touch on the question under enquiry.

Second. The corn fodder crushed at a cost of $1.00 per ton was well eaten and gave as good results when grain was fed in moderate quantities as hay. It must not be inferred from this that when fed alone it has the same value as good hay. I esteem it to have a practical value of three-fourths that of good timothy hay. The experiment shows that we can utilize corn fodder fully if we deem it best to.

Thirdly. The cotton seed meal, supplying the albuminoids in which corn fodder is deficient, has made the best gain for the entire period of 111 days, excepting corn meal, by 10 pounds, and very much the best gain per pound of food eaten. They ate 5,081 pounds; corn meal lot 6,044 pounds; hay and whole corn fed lot 5,870 pounds.

During the past winter, three lots of steers have been fed, and the following results noted:

Before stating them, I desire to observe that we have no accommodations for feeding, the limited trial in question being carried on under great disadvantage. When proper, or any means are afforded for prosecuting experiments in feeding, we have several matters of very great importance to the stock interests of the State to investigate.

A lot of three steers, weighing 3,016 pounds, February 16, fed on timothy and redtop hay, gained to March 18, but 33 pounds. Lot 2, weighing, February 16, 3,005 pounds, gained to March 18, 102 pounds. Their food was clover hay and corn fodder. Lot 3, weighing 2,860 pounds, February 16, gained to March 18, 94 pounds. Their food was corn fodder and two and one-half pounds each of middlings and of cotton seed meal per steer. Lot 1 ate 2,136 pounds and 450 pounds meal. Lot 2 ate 1,551 pounds clover and corn fodder and 450 pounds meal. Lot 3 ate 940 pounds corn fodder and 450 pounds meal, or five pounds by each steer daily.

It will be observed that less than a pound of corn fodder in a ration of clover, or of certain meals, is fully as efficacious as hay. This result from hay is not a representative one. Clear timothy gave a gain of a pound a day in former experiments.

Feeding is an art worthy of our closest study and observation. Our imperfect methods must give way to systematic care and feeding.

At the close of the session, the Board tendered a serenade to the Governor, at his hotel, receiving from him a felicitous response. 'Squire Turner of Columbia, by request, also in a humorous vein, added to the response of Governor Crittenden.

The Board, through the kindness of its officers, visited a new and well appointed creamery, not yet put in motion. Since the meeting, the creamery has begun its work with reported success.

MEETING OF THE BOARD AT OAK RIDGE.

CAPE GIRARDEAU COUNTY, February 5.

A week of rainy days, coupled with previous warm ones, made the roads almost impassable, both those centering at Oak Ridge and at Brazeau, where, at the latter place, sessions were held on the 7th and 8th.

The condition of the roads prevented the Secretary from arriving at the afternoon session on the 5th.

This session was opened by the President of the Board, Hon. John Walker, who gave an address on "Fifty Years of Farm Progress," and a subsequent talk on creameries. The latter subject was discussed at length, exciting much interest as manifested by letters subsequently received by the Secretary regarding creameries. From those present the Secretary ascertained that notwithstanding the severe rain the house was well filled and the remarks of Mr. Walker were well received.

EVENING SESSION.

Very rainy, not many present.

President Walker in the chair.

The President introduced the Secretary, who, by request, proceeded to consider the question of

HOW TO FARM PROFITABLY.

A brief synopsis, only, can be given of the talk. He said: "Our system of farming is known as 'extensive farming,' and is managed on the robber principle. It is large areas tilled for crop sales. This method involves much soil open to washing rains, to the loss of the nitrogen by volatilization and by leaching in form of nitric acid. The crops grown so extensively find a market beyond our borders with all of their soil fertility. The combined influence of these losses has steadily reduced our crops for the past twenty years, until we now average of corn and wheat, of the former only 26.6 bushels for the average of the past five years, and of wheat 11.7 bushels for the same period, amounts clearly below the point of profit when all the elements of the cost of running a farm for the year are considered. A change is imperative in our farm system. In the East, Europe and all countries where the opposite of our system prevails or the 'intensive' method, more grass and crops adapted to home consumption are raised. Our policy now is to grow more grass and stock foods, selling our crops through our stock and gaining the excrements for fertilizing the soil. As calculated to aid in improving and in conserving the fertility of our farms and also calculated to give good crops, I would advise the adoption of a systematic rotation. From Oriental agriculture until the present all good agriculture has been founded upon rotations. A rotation that is calculated for stock farming, profit and the conservation of soil fertility carries with it grass as a leading crop. For the Agricultural College Farm I have arranged a five years' rotation, from which I am in hopes of gaining nine crops in five years:

First crop—Corn, for a good cleaning crop of weeds, for good tillage crop and feeding crop for home consumption.

Second—Oats for hay, followed in same year by a clover crop.

Third year—Two crops of clover.

Fourth year—Wheat, only sale crop grown and followed in same season by timothy.

Fifth year—Two crops timothy.

Two crops in a season are the product of good management or of high manuring and rotations only. Theoretically rotations give more product per acre for a series of years than succession crops because each crop has its own area of root development, different leaf development, matures at various seasons of the year and each exhausts the soil of its food material in varying proportions."

The various points raised were fully discussed by the speaker and reasons given for his views.

Question by President Walker.—Do you favor subsoiling?

Answer—Yes, on certain soils, those that have a compact subsoil For 1883, at the college farm, I got by accurate tests 21 bushels more of corn, and several hundred more pounds of stalks per acre on subsoiled ground. The subsoiled ground by test contained 1.77 per cent. more moisture, or nearly 100,000 pounds more water per acre. The impervious hard pan had been opened to the water of the soil instead of turning it off. Many mistake deep plowing for subsoiling.

Q.—Would you turn up fresh soil to the surface?

A.—No, and yes; depending on character of soil. I have known compact sour soils turned two inches deeper than usual to injure the surface soil for years. Again, soils deep and more open have given better results.

Mr. Heywood, of Ironton, said that he had raised good potatoes on fresh soil from five feet in depth.

Mr. ——— found that wheat had failed on crude, raw, compact soil freshly turned.

Mr. ———: Would you till wheat deep?

Mr. Sanborn.—Wheat, I find, by digging some plants, roots deeply. I would till deep and fine the soil well, but compress the soil by rolling, as wheat likes a fine but compact soil.

Mr. ———: Would you fall plow for corn?

Mr. ———: I would; insects are destroyed and the ground is tilled easier.

President Walker.—I would plow in winter as insects are disturbed when they will freeze. Early plowing gives the insects chance to burrow in the ground again. Ground then breaks easier as the frosts lift it. Regarding wheat and deep plowing, I may say that the soil must determine. Certain deep soils, not too cold and sour below the ordinary depth of plowing, give good results for deeper plowing than customary. Many farmers have had flattering results from deep plowing.

Much may be learned at the State Agricultural College at Columbia of wheat. I have had two sons there, and they learned there in a short time that which has required years of observation on my part to obtain. A model of a kernel of wheat shows its structure, its various coats, its vital part, the germ. In their laboratory wheat is separated into its conponent parts. Its character is closely studied, its adaptation to soils, how to handle soils for wheat, and various other elements that enter into the economical growth of wheat. The tuition is but $20 a year.

Turning to the ladies, the speaker remarked that the college was open to them. "There, through its greenhouse and horticultural grounds, a taste for and the art of home adornment is acquired that applied will aid much in elevating the home life and beautifying the surroundings of the farmer." In beautifully chosen words, he then, from mythology, reviewed the watchful care of the presiding goddesses, Ceres, Pomona and Flora, over the departments of farm life they are represented as creating.

In concluding, the speaker introduced Mr. Eshbaugh, Master of the State Grange and member of the board.

Mr. Eshbaugh's talk was informal, starting from no selected subject:

"We have made important improvements in farm implements, but very little in our farm results. Our crops are no larger than formerly. In my own experience I have grown corn at no profit. Subsoiling and applying liquid manure has carried my wheat up to 28 bushels per acre. The subsoiling, in my opinion, was the cause of increase. I received 42 bushels per acre, and the benefit is permanent. I find it advisable to grow less corn. Wheat, as grown, does not now pay. In the domestic stock department the same want of profit often prevails. I know of lots of cattle kept at a loss. I now have a calf weighing 650 pounds at seven months of age. I have others that weigh but 250 pounds at about the same age. For the first, I was offered $50. Can we not change our methods and grow the $50 class of stock? Our good consists in improving our farms and leaving to our children better farms in the place of money and impoverished farms."

Mr. Walker, in answering a question, said that he believed in thorough tillage for corn but not too deep. Deep cultivation forces the roots down below the natural point and away from the sun.

Mr. ——: How do you feed your calf?

Mr. Eshbaugh. At four weeks I gave him skim milk and scalded bran and often a little meal and grass.

Mr. ——: I plowed my ground deep for several years. The first crop was not a good one but grew better each year. It will not wash as bad when plowed deep.

Mr. Walker: By repeated deep plowings we get the various layers mixed and the raw earth is distributed.

Mr. Sanborn, in answer to a question, said that where it is difficult to plow across a hill to prevent washing the swivel plow could be used, which passes back and forth on the same side of the hill, or in the last furrow made. Such a plow also prevents dead furrows and turning on plowed ground. Modern swivel plows are now being made to do good work on level ground but are not likely at present to be used on level ground farms.

Mr. ——: How would you till corn?

Mr. Sanborn: I would till shallow. The old notion that loose soil absorbs moisture is now exploded. Tillage forms a mulch over the soil below and prevents evaporation of moisture by overlying the little capillary tubes formed by the upward flow of water during evaporation. Last summer I made a direct test of the question, the first that I know of made direct with the soil, and found at the College Farm that a soil hoed two inches deep held more moisture below this two inches than unhoed soil by 100,000 pounds or more per acre.

Mr. Walker agreed with Mr. Sanborn unless the soil was compact below and needed loosening. He would not wish ordinarily to go deep enough to cut the roots of our crops. Corn roots soon extend entirely across the row.

Mr. ——: How would you plow?

Mr. Sanborn: In sandy soils I would invert the furrow completely over, flat and smooth. A heavy soil I would lap the furrow, or let the edge of one rest on that of the one preceding it, so as to leave a little space beneath.

Mr. Heywood, of Ironton, in response to a call, said that farmers' sons fly the farm because we teach farming as a drudgery and make it profitless.

WEDNESDAY MORNING.

Met according to adjournment at 9½ A. M.

President Walker in the chair.

In introducing the Secretary, the President made a few remarks favoring greater attention to stock raising.

Secretary Sanborn's subject was "Animal Nutrition." Similar ground was discussed as at Higginsville, varying to adapt it to the conditions of Cape Girardeau county. The reader will find this lecture in connection with the report of the Higginsville meeting.

Mr. Walker and others discussed the subject at some length, mainly in a confirmatory way.

Mr. Walker had found stock feeding, carefully conducted, profitable. He believed in utilizing the rough food spoken of. His practice had been to mix it with clover as it was stacked. He arranged the stacks side by side, and as the stack of clover or straw was forming, a layer of the other food was at regular intervals added, thus forming a stack of alternate layers of clover and straw. In feeding, when scattering it on the ground, straw was placed in washes in order to get them filled.

Questioned: Mr. Sanborn, in response, said that he would grind corn fine, as fine as burr mills grind for family use. Cobs, he had found, in several years of exact experiments, were valuable if finely ground, otherwise useless for pigs. For cows, he had found them of but little value for butter.

Levi Chubbuck, Superintendent of the Agricultural College Farm, was next introduced by the President.

INDIAN CORN.

BY LEVI CHUBBUCK, B. A. S.

Indian corn, or maize, belongs to the order graminae, or grass family, to the genus zea and species maize. The term "corn" is applied to it because it is the leading grain of the country, as that term is given to the most important grain of any country. Thus, oats are known as corn in Scotland, rye in Norway, and wheat in Egypt. It is called Indian corn because the American Indians were found cultivating it when the country was discovered.

From the fact that they had several kinds in cultivation at the time of the discovery of America, and that charred remains of corn have been found in the mounds of the ancient mound builders, which may be thousands of years old, it is supposed that the plant is of American origin. Still, there are facts which would seem to indicate that it may be of Eastern origin. It is recorded that it was introduced into Java by the Portuguese in 1496.

The first mention made of it by Chinese writers is at the close of the 16th century, who said that it came from Central Asia, although Brun says it reached China in 1516; Humbolt says that it is certain that it was introduced into Africa by the Portuguese in the 16th century. It was introduced into Europe, most probably, by Columbus, on his return from one of his early voyages. Nothing definite is known, however, regarding its origin.

But the fact that it is grown so extensively on the Western Continent and to but a small extent on the Eastern Continent, shows its greater adaptability to the former.

The great value of this cereal to this country and the world is partly comprehended by considering a few facts. The yield in this country, for the year 1883, is estimated to be over 1,500,000,000 bushels. This, at 50 cents per bushel, gives us the enormous sum of $750,000,000 as the money value of a single crop. The number of bushels of wheat grown in the same year is 425,000,000, worth as many dollars; oats, 570,000,000 bushels, worth $142,000,000, making a total of $567,000,000 as the value of the wheat and oat crop, or $183,000,000 less than the value of the corn crop alone. The value of corn for food, places it in a high rank. It was formerly supposed that it contained an excessive amount of oil and starch, and but little gluten, hence was a fattening food and not good for the growing or flesh forming period. By the German feeding tests and tables, it is seen that the amount of flesh-forming material in corn is but little below that of wheat; and these tables do not show as favorably for corn as do American tests and analyses. The grain contains all the elements essential to animal growth and in about the right proportion, save in minerals. It is said that a workingman can sustain life longer on cornmeal than on any other single food. It is easy of digestion, having but little crude fiber. For butter-making, cornmeal ranks the highest of any known single food. It has been demonstrated that milch cows will do well on corn-meal alone. It makes butter of almost as good a color as June grass. The quantity made is fair and the texture is unsurpassed.

The value of corn fodder for cattle food is a matter which should interest the farmers of the country much more than it does. The amount of fodder grown in this country is enormous, and could it all be saved and fed would allow much more stock to be handled. More stock means more manure; more manure larger crops, and larger crops more stock again. It is estimated that for every 25 bushels of corn there is one ton of fodder grown.

Taking the production of the country in 1883 to have been 1,500,000,000 bushels, then there were not less than 60,000,000 tons of fodder

grown. Of this probably not one-half was utilized as food, the rest going to waste. Now these same German feeding lists and analyses show that corn fodder falls but little below timothy hay in nutritive value, and could it be economically fed, two tons would be sufficient for a thousand pound animal for the winter. This being the case, our 30,000,000 tons of wasted fodder a year, would winter 15,000,000 head of cattle more than are handled. Last year's corn crop, of our own State, of 160,000,000 bushels, represents a fodder crop of 6,400,000 tons of which, probably, over 3,000,000 tons were wasted, consequently we wintered over 1,000,000 head of stock less than could have been wintered on the food actually grown. The value of corn as a cleaning crop should not be overlooked, although it is but rarely considered.

In England, roots are largely grown, not so much for their food value, but for the benefit done to the land by the thorough tillage which such a crop must receive. A crop of corn can be taken care of, be thoroughly tilled and the land cleaned of weeds at a much smaller cost than would be the cost of an acre for a crop of roots.

Could England grow Indian corn successfully her farmers would be glad indeed and roots would, probably, largely disappear from the English system of rotation of crops.

It is grown to some extent in Europe, in Russia and Spain as a field crop, and in other parts often in gardens as an ornamental plant. Mexico and South America produces considerable. In the United States it is more extensively grown than any other plant, being cultivated in all parts of the land, excepting in a narrow strip along the Pacific coast, where, although the average temperature of the year is higher than with us, it is too cool during the growing season for corn to mature.

To grow corn successfully there must be at least one month during which the temperature is as high as 90 deg. F., and it will be better for the corn if the mercury reaches 100 deg. The corn grown in the Northern States differs considerably from the Southern grown. That usually raised in the north is smaller in all its parts and of the class known as Flint corn, and matures in much less time than Southern corn requires. In the Northern part of the country they often have less than 90 days between frosts, and hence must have a kind that will mature as quickly as possible. Going south the corn increases in size, the stalk, ear and kernel becoming larger, and in the Southern States usually of the Dent class. The cob and grain of the Dents are softer than the Flint corn.

While the Southern corn cannot be grown in the North, because of the short season, some varieties of northern corn can be quite success-

fully grown in the South. Some of the earlier kinds can be planted in this State after wheat harvest, and if the weather is moist enough, it will mature a crop. These kinds are also profitable to plant early, especially in seasons following years of short crops. Notwithstanding the fact that they grow a smaller kind of corn in New England, they raise more bushels to the acre than is done in the South and West. This is not because they have better soil, or that the climate is better adapted to corn, but because they pursue a better system of cultivation. This is owing largely to the fact that the fields of New England are smaller than those of other sections of the country, and so they can put on more labor and attend them better than are the large fields of the South and West. The editor of the Rural New Yorker grew on several acres 170 bushels of shelled corn per acre. This is one of the largest yields on record. Yields of 100, 110 and 120 bushels per acre have often been reported; though an average yield of fifty bushels per acre is considered a large crop in the West and South. This might be largely increased by a better system of cultivation. The West produces by far the largest part of the corn crop. But this is because of the larger acreage planted.

The leading corn producing States are Illinois, Iowa, Missouri, Indiana and Ohio, in the order named. The purpose to which the corn is to be put will determine somewhat the kind of corn to plant. If the corn is to be fed in the ear to cattle, the ears should not be too large, the cob small and easy to break, and the grain rather soft, and it should have a large proportion of oil. If the corn is to be cut up and fed to stock without husking, a kind that produces several small ears on a stalk is good, for such a corn will produce well and the ears can be easily eaten. Blount's Prolific is a good kind for this purpose. If the corn is to be husked it is better that the ears be large, for the husking can be done more rapidly than when they are small. If it is wanted to grind into meal for human food, a large, white and firm grain is best; the white being freer from oil than yellow kinds. The St. Charles county white meets these requirements and is most sought for by millers. If the corn is to be ground and fed to cattle, the yellow flint corn of New England is as good as any. It has a large proportion of oil, and hence is likely to become rancid when ground. Our success in raising corn depends very much upon the seed planted. We should thoroughly understand the nature and habits of the plant, then with care we may greatly increase the yield of our corn.

To have good seeds it is as necessary that the seed be well bred as that stock be well bred to have a good grade of cattle.

The science of seed breeding is of even more importance than the science of stock breeding, for by seeds and their products the life of the animal world is sustained. The breeding of seeds depends on the same scientific principles as does the breeding of animals. We have the two sexes, the male and female in both kingdoms, though in a more varied manner in the vegetable than in the animal kingdom. In the latter, the sexual male organs are always found in one individual and the female organs in another; but in the vegetable kingdom, the two sets of organs may be in different plants, or they may be in one plant, but located in different parts of the plant; or, again, they may, as is most commonly the case, be situated together in the flower; the stamens of the flower being the male and the pistils the female organs.

The corn plant belongs to the second class, or those having the two sets of organs in different parts of the plant and is known as a monoecious plant.

In the corn the stamens, or male organs, are located in the tassel, and the silks are parts of the pistils or female organs.

The office of stamens is to produce pollen which is the fertilizing agent in the vegetable kingdom. This pollen, which is the yellow dust that may be seen falling in showers in a cornfield when in blossom, is composed of very minute grains. One of these grains must come in contact with the germ in the female organ before it will ever develop into a perfect and fertile seed.

The corn silks, or female organs, are hollow; at the upper end is an opening, and the lower end terminates in the ovary in which is the germ of the future seed and plant. There are as many silks as germs to be fertilized and developed.

That there may be grain, a grain of pollen must fall into the opening, or mouth of the silk, make its way down into the ovary and touch the germ. Understanding these facts we see how we can breed to a particular type or how we can change the type; how, through care, we can improve our corn, and through neglect of it let it degenerate.

Dr. Sturtevant, of the New York Experimental Station, made some experiments based on the theory that the ears of a stalk are not fertilized by the pollen from the same stalk, as the silks are not ready to receive it when it is ready to fall. So the ear of one stalk is fertilized by the pollen of another, and one that may be barren, as there is a large per cent. of barren stalks in every field. So to improve his seed corn he goes through the field as soon as he can determine the barren stalks and cuts off the tassels of such that they may not fertilize other plants, and thus perpetuate their qualities. He greatly

increased the yield of his corn by pursuing this method. Another person, Mr. Blount, sought to increase the number of ears on a stalk. He did this by selecting seed only from stalks that had two or more ears, and of these only the upper ear, deeming that the true seed.

His theory is that in its normal condition there should be an ear at every point that has a groove. He has succeeded in growing a corn, Blount's White Prolific, that bears from five to ten ears on a stalk. From these results we see that by having an idea of what we wish our corn to be and choosing our seed according to the ideal, we can soon make the wished for change.

A model ear of corn is one the rows of which are close together and straight, the tops of the kernels coming up square, leaving no vacant space between the rows and the grains broad and deep. The ear should maintain its size from butt to tip and be well filled out at both ends.

The best way to get good seed corn is to grow it; that is, grow corn expressly for seed. Take some of the best seed that can be obtained, plant it on rich soil and cultivate it in the most thorough manner. Having only a small piece, say an acre, this can easily be done, and the result will be corn of the first quality. Planting this seed for the main crop we will get, if "like produces like," a good quantity and quality of corn. After having grown the seed there should be some thought as to its care during the winter. It is best kept in a cool and dry place where the temperature will be even. Corn will bear a much lower temperature if dry than if wet. Care must also be taken to keep rats and mice from gnawing the corn, for if the hull of the grain is broken and the softer inner parts exposed, when planted, it will water soak and rot before it can germinate. And for this reason shellers should not be used to shell seed corn, as they are liable to break the hull.

The corn plant is not very particular as to the kind of soil it must have if it is only rich. It is a good feeder and will bear and repay generous feeding. It is a shallow feeder, that is, it feeds near the surface, hence its food should not be very deep; neither does the soil need mellowing very deep, although there are a few roots that descend many feet if they can, and the subsoil should be of such a character and condition that these may penetrate it. Subsoiling has a good effect on corn in this State.

Land plowed in the fall and then thoroughly pulverized in the spring, with one of the improved harrows or pulverizers, will be in good condition for corn. Nothing is gained by working corn land early if wet, for it cannot be properly fitted, and corn planted later on well

prepared land, will over take that planted on land poorly prepared. Still it should be planted as early as it is consistent with good preparation.

Do not plant too deep; two inches are enough if the ground is moist, although it is often planted six inches deep. The soil should be firmly pressed upon the seed, especially if the ground is dry. That more corn can be grown in drills than in hills has been often proved; but the objection is made to this method, "that the corn can't be kept clean." It can be if taken in time, and worked at the right time always, and with the right kind of tools. A smoothing harrow with slanting teeth, having a sweep of three rows, thus going over three times as much ground as a two-horse cultivator, should be started. It may be before the corn is up, and should be continued in use at short intervals, until the corn is too large. Could this method of working be continued all through the seasons, it would be much better for the land and corn.

The Diamond plow and a two-horse cultivator are an abomination in a corn field. In the first place, they injure the land by leaving it so that it washes badly. In the second place, they injure the corn by cutting off the roots.

Here, again, is where a knowledge of a few of the facts that Botany teaches would benefit the farmer. Did he understand the nature and office of the roots of plants, he would not cut them off so recklessly as he does when plowing his corn. They act as stays to the plant, and if cut off the plant is more easily injured and blown down by storms.

It is through the roots that the plant gets its food, and the younger portions, that is, those parts most distant from the plant, are the most active, and the more you cut off of these young and fibrous roots, the more you take away its power of feeding.

In the west, the corn is usually husked from the stalk into wagons and hauled to the crib. The stalks are left standing, and are plowed under in the spring. As before remarked, this causes a great waste of food. When the fodder is saved, it is usually cut up and put into shocks from twelve to sixteen hills square. A better way is to make the shocks much smaller, say from four to eight hills square. These tied up firmly with twine, can stand until the corn is dry enough to crib, then it can be husked out into wagons without disturbing the shock. After husking, the fodder can be hauled from the field and stacked. After cutting off the tie stalks, the entire stock can be pitched bodily on to the wagon and pitched from the wagon to the stack, thus avoiding the disagreeable work of handling the fodder with hands, as must be done if in larger shocks.

Mr. Walker followed the lecturer with a few practical remarks, saying: "I would row across the hill to prevent washing. The rows, also, should run north and south, admitting the sun and air, both of which are essential to fullest success. When three inches high, I thin out the weaker plants, leaving two plants to the hill. I prefer to thin early, before the roots of the plants interlace, and thus become subject to disturbance by the pulling up of those thinned out. At the period of tasseling, I stop cultivating.

In stacking my corn fodder, I so arrange it as to give a slope from the center of the stack outward. Fodder should be stacked, for during fall and winter rains it is subject to great losses.

The methods of cutting and curing, described by Mr. Sanborn and by Mr. Chubbuck, as in use at the College Farm, are good, and I shall adopt them. The system named, by putting 16 hills, only, into a shock and then cheaply binding with rye straw, makes a shock so light that, as described, a man or two can handle the shocks to a load about as fast as they can walk along a row of them. The ability to remove these little bundles to a stack and to remove again to be fed must be very convenient."

Mr. ———: At what time do you cut up your corn?

Mr. Sanborn: Just as the seed begins to harden. In experiments I have found that just as much corn is then got per acre, and of as full a feeding value, while the fodder is much more valuable. Fodder standing in the field is, by breaking down and washing by rains, much damaged and made unpalatable.

Mr. Eshbaugh: Cannot our corn plows be changed to harrow style by placing harrows where shovel teeth occur in order to give the shallow tillage advocated? I suggest it.

Mr. Walker: Deep tillage, early, cuts the roots of corn, for soon the roots extend across the rows.

Mr. Sanborn gave his experience in digging corn roots, finding that when the corn was five or six inches high, the roots were often two feet long.

Mr. ———: Would you plant the whole of the ear?

Mr. Walker: I prefer the large kernels. They carry more nutriment.

Mr. Sanborn detailed recorded experience in planting all the corn of an ear, finding evidence conflicting. Dr. Sturtevant's careful trials ggve queer results, showing that position of kernel on seed ear modified the ratio of sound to unsound product, and in several other respects influencing the result. He found as good a result from the tip kernels of the ear as from elsewhere. Dark colored seed seems to be the best

Mr. ————: Where does the kernel form first?

This question was wrestled with by several without eliciting the same result or opinion. Most thought they all formed at the same time. Mr. Walker believed that near the butt, but not the first, seeds developed first. Mr. Long said the first seeds at the butt formed last.

Mr. Walker advocated closer selection of seed, small cob, straight rows, well tipped out and sound.

Mr. Sanborn advocated selecting seed in the field, that the plant might be seen and early corn be got.

Several questions were asked the lecturer regarding corn fodder, which elicited from Mr. Chubbuck his belief that it is very valuable when properly handled. Eighty-five per cent. is eaten of that fed at the college farm, and where it is cut about all is consumed.

AFTERNOON SESSION.

Chairman Walker opened this session with remarks regarding feeding. For a calf he gave ground corn and oats with some bran mixed in. His feed was one quart of this at a ration. In feeding hay, the oats were kept daily removed, being replaced with fresh hay. Breathing upon hay makes it distasteful. Grass alone is sufficient where a good pasture is kept. Pure water is essential. The Hereford and polled cattle make good "Rustlers" for the ranche, but the Short Horn with care is superior for settled communities. Crossing well defined breeds gives no good results.

Stock requires shelter. Shelter has become a question of great importance. I keep my cows under shelter and save one-third of the fodder. A cheap substitute for a barn is found in a straw shed.

The above is a brief synopsis of Mr. Walker's remarks designed to occupy the time while the audience was coming in.

The Chairman: I now introduce to you Hon. H. Eshbaugh.

(Remarks of Hon. H. Eshbaugh are promised for the printer and will occur in later section of the report. Sec'y.)

The Chairman: We have with us Mr. Heywood, of Ironton, who has come a long distance. I hope that Mr. Heywood will favor us with some remarks.

Mr. — Heywood: I came to make one of the audience, and not as one of the speakers. I glory in the calling and am willing to add my experience to that of others. I have had some success in renovating a used up field on a farm that I purchased. I sowed clover in the spring and plowed it under the next June. This was followed by sorghum, which crop gave an immense yield, giving me much trouble to

plow under. I succeeded in plowing, finally, by harrowing and dragging down the plant, plowing by a Michigan plow, 10 inches deep. This deep plowing turned up two to three inches of raw clay. I next year planted to corn with the most favorable result, where two bushels before renovation would have been all that would have grown. Sorghum is a good renovating crop, better even than clover, as it will grow on a poorer soil. I have adopted mixed farming. Have sold butter for 45 cents a pound, and in addition, pork, bacon, wool, mutton and flour. I find that I get forty pounds of flour and eight pounds of bran, for a bushel of wheat, and thus realize more for my wheat. But the millers do not care to grind for me, preferring to swap wheat, giving in exchange thirty-three pounds of flour and seven pounds of bran.

A brief discussion was held upon the subject matter presented by Mr. Heywood. Mixed farming was approved of as the policy of our farmers.

On motion of a citizen, whose name I did not obtain, it was voted to recommend the printing by the State of the text books for our common schools, and to request the Superintendent of Public Instruction to use his influence to secure this desired end.

By request, Mr. Sanborn gave a five minutes talk upon private dairying, after which the Board adjourned *sine die*.

BOARD MEETING AT BRAZEAU, PERRY COUNTY, FEB. 7 AND 8.

From Oak Ridge, the members of the Board went direct to Brazeau, fifteen miles distant. The roads were still nearly impassable, necessitating walking much of the way to relieve the horses, which were unequal to the task. It still continued rainy, yet despite hindrances of mud and water the Board were greeted by one hundred or more farmers with their families.

AFTERNOON SESSION.

President Walker opened this session with a brief statement regarding the organization and work of the Board. He spoke of the advantages of a more thorough information regarding agriculture, and of the necessity the business is under of acquiring improved methods. Conditions are changing rapidly and require on our part alertness in keeping step with them, said the speaker. Agricultural education was advocated with much force. The sending of his own sons to our State Agricultural College, he said, had been of great use to them. They were both successful farmers.

BUTTER MAKING.

BY THE SECRETARY.

The speaker called attention to the unprofitable condition of wheat and corn growing; to the necessity of the butter cow for cheap beef; to the saving of fertility by feeding our corn at home; to the greater profit of dairying than of crop sales; to the methods of selecting and feeding dairy stock; to the necessity of housing cows and treating them kindly; to the different methods of setting milk and their relative values. The speaker advocated creameries as the best method of developing our much neglected dairy interests.

Mr. Walker followed, giving methods of organizing creameries, advocating the division of creamery stock among the patrons, as then the farmers became interested in the success of the creamery. About $5,000 capital, he said, is needed. The building requires three rooms, namely, engine, refrigerator and work rooms. A lot of five to ten acres is usually procured, giving room for a pond for ice and for other necessary uses about a creamery.

The methods of gathering cream, paying for it, testing the cream to secure against adulteration, were considered. The speaker favored the establishment of creameries more freely over the State, the number now exceeding fifty that are organized in Missouri, yet not a fifteenth of the number organized in Iowa, where creamery butter has done much to increase the wealth of the communities where located.

EVENING SESSION.

President Walker, in very happy words, suggested by the myths regarding Pomona, the Goddess of fruits, introduced Mr. Teubner, of the State Agricultural College nursery:

HORTICULTURE IN MISSOURI.

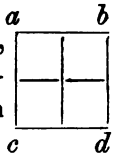
BY CHARLES TEUBNER.

LOCATION OF AN ORCHARD.

Elevated sites and northern or northwestern exposures are preferable, but steep slopes should be avoided on account of soil washing.

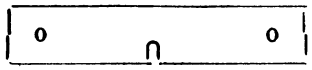
LAYING OFF AN ORCHARD.

On level grounds, and where a neat job is desired, the following plan simplifies matters:



Set a stake at *a*, the starting point, and another at *b*. With a tape line, the distance apart for the trees is then staked off. Next, a row is run in like manner at a right angle from *a* to *c*; then those from *c* and *b* to *d*. Center rows are staked off next as auxiliaries. The other rows can be staked off without the aid of a

tapeline, by two men sighting crosswise, while a third suspends a stake, moving it as directed, until it intersects the line of sight of the two men, where it is placed. The stakes should be straight and of the same size as the trees, and set perpendicular, or else the trees cannot be placed accurately in planting. As an aid in planting trees in line, use an inch board, 4 inches wide, with an inch hole bored on a line with the center, 2 inches from each end and one in the center, sawing a slit across to this center hole. (See diagram.)



Place the board with a slit around a stake, push a sharpened stick through the end holes of the board, which leaves corresponding holes in the ground, and proceed in like manner with all the stakes. Next dig the holes for the trees, taking care not to cover the small holes corresponding with the end holes of the board. When planting, stick a peg in each of these holes, place the board over the pegs, set the tree with the body in the slit and it will stand exactly where the stake was. After planting, remove the board, pull the pegs and proceed in the same manner with all the trees.

ORCHARD RECORD.

Every one planting an orchard should make a plot of it, giving the name and location of each tree, so that the loss of any tree may be replaced with another of the same variety, and the mixing of varieties thus be avoided.

The label should never be allowed to remain on the tree after planting, as the string or wire cuts into the bark so much that the limb or body above it often breaks off in consequence.

CARE OF TREES.

A tree is a thing of life, and should be treated accordingly. Many trees are lost through the ignorance or negligence of the purchaser, and the nurseryman blamed for it.

In procuring trees from a nursery or place of delivery, no matter how short the distance they are to be carried, the roots should be closely coveredwith wet straw or sacks, to prevent drying, for the secret of success in getting trees to start well lies in the words: "Keep the roots moist!" Even in a dormant state, the body and limbs are passing off moisture through respiration, which must be replaced. Upon arriving at home, the bundles should be taken apart immediate-

ly and the trees "'heeled in" in trenches, first wetting the roots where they may remain until planted. Never stow them away in a cellar or shed, unless they are to be planted on the same day.

INJURED TREES.

When trees arrive in a frozen or dry condition, they should be buried, root and branch, in moist earth or in water, two or three days, which draws out the frost, or gradually infuses new life into the dried ones, unless too far gone, many apparently hopeless cases may thus be resuscitated.

HEELING IN OVER WINTER.

For this, a dry spot should be selected. Open a trench 6 to 8 feet long and deep enough to admit all roots, the ends of which are first to be cut off smooth, so they may callous rapidly; place the trees in, one by one and far enough apart so that the roots do not lap, leaving the bodies to the *south* at an angle of 45 degrees, then wet the roots and cover with pulverized earth, bringing each root in contact with it, and firmly pressing it down with the foot. Place another layer in the trench, reclining the tops on the others, etc. After all are in, more soil is thrown among the trees, until they are covered almost to the tops. It is well to cut a ditch around them deep enough to drain the trench, as standing water injures the roots. Heel in grapevines and small fruits in the same manner.

No trees or plants should be heeled in in the *bundle*. The greatest care should be taken to do the work thoroughly, as a bungling job may cause serious losses. No straw or grass should be allowed near them, as it attracts and harbors mice and rabbits.

WHEN TO PLANT.

Fall is generally conceded to be the best time, for several reasons: The soil is generally in a better condition for planting than in the spring; the season for planting lasts longer; planters, especially farmers, are not pressed with other work; roads are in a better condition—an item where trees have to be hauled any distance, and, what is of more importance, it affords time for the cut ends of the roots to callous over and the soil to settle about them. This enables them to start growing as soon as the weather becomes warm in the spring, thus gaining several weeks growth over those planted in the spring—an advantage in case of a drouth. Besides, the prices are generally lower in the fall, and there is a larger stock to select from. Even when it is not

convenient to plant in the fall, the trees may be heeled in over winter, so as to have them on hand *earlier* in the spring.

WHAT TO PLANT.

We are too fast a people. Most planters are so impatient that they try to steal a march on time by planting large trees. This is a serious mistake, and works harm. *As a rule*, a young tree will bear as soon as an older one, because it will take hold quicker, and does not feel the change so much, while the other is set back by the severe check to its system, caused by transplanting, and needs more time to overcome it. Apple trees over three years old are too old to plant, and rarely make a sound, vigorous, long-lived tree, besides being more liable to the attacks of the borer, which is proof of their diseased condition, caused by the stagnation of sap, resulting from the loss of too many of its fibrous roots or feeders, which, being farthest from the trunk, are detached in taking up the tree. There is also too much top, and if cut back to correspond with the roots, the wounds prove equally injurious. Small trees, however, retain the fibrous roots, having them near the body, and their system is taxed to a less extent. A thrifty two-year-old tree, all things considered, is the best, and I would prefer a one-year-old to a four-year-old. Buy only first class trees; they cost but little more than second or third class, and are cheaper in the end. An ill-shaped or stunted tree is as unprofitable as a stunted animal.

HOW TO PLANT.

The soil must be prepared for the reception of the trees by thorough plowing, subsoiling and pulverizing. On a level site, the ground should be plowed into lands, throwing the furrows together, so that ridges are formed, on which trees are planted, leaving an open furrow between the ridges for drainage. The holes should be dug twice as large as the space the roots occupy. The cut ends of the roots are pared off smooth, if not already done when heeled in, and the broken ones removed.

In planting, they are first dipped into a bucket of water, carried along for the purpose. This is of vital importance, as roots will dry off, more or less, in carrying to the holes, which tends to closing up the pores, and if planted in that condition, will be much slower in starting. When the roots are wet, however, the soil adheres to them, forming an instantaneous connection, enabling them to draw sustenance at once. As most trees have their roots near the surface, they should be

planted very little deeper than they stood in the nursery, an inch being generally sufficient. The roots should be spread out, evenly, and fresh pulverized earth worked in among them with the fingers or a stick, care being taken to fill all empty spaces among the roots. This part of planting is of importance, and should receive careful attention. When the hole is filled up to within a few inches of the top the tree is given several up and down shakes, to settle the earth, which is then firmly pressed, not stamped, down with the foot, and the hole finished up with *loose* soil, which should be banked up several inches into a mound shape, if the planting is done in the fall, in order to give stability to the tree and shed all superfluous water. It is not necessary to water trees *after planting*, but if the earth is very dry when planting, a bucketful of water may be poured into the hole, the tree set in, and the hole gradually filled with earth, which the water soon permeates by capillary attraction. In all such cases the pressing of the soil should be omitted. On prairies, where strong southwest winds prevail, trees should be inclined slightly to the southwest. After planting the limbs should be cut back to about one-half or one-third of the last season's growth, giving the tree a pyramidal shape, and aiming to balance the head or top so that the limbs extend an equal distance from the body on every side.

MULCHING.

This is an important and much-neglected operation. For young trees which receive a thorough cultivation, it is not so necessary, but after the ground is sown to clover, the soil about a tree should have a top dressing of straw, old hay or leaves, several inches deep and extending out beyond the ends of the limbs, and this mulch covered with a layer of earth, to guard against harboring mice. For this same reason an open space should be left around the body of the tree. Without these precautions the mulch is apt to attract mice, whom I have known in such cases to gnaw and kill trees, even in summer. Mulching keeps the soil open and porous, thereby enabling rain to penetrate readily, and as it retains moisture a long time it is a valuable adjunct in dry seasons. It also serves to keep down weeds. Apply it early in spring. Old trees, and those which are standing on poor soil, are also greatly benefitted by mulching.

CULTIVATION.

Every orchard, especially of apples, should receive a thorough cultivation the first two or three years, and may be planted to corn,

potatoes or a similar crop, after which they may be sown to clover. No kind of grain should *ever* be sown in an orchard, as it absorbs too much moisture at just that time when trees stand most in need of it. Anyone who will compare the condition of soil in a field of oats or wheat, during the latter part of June, in an ordinary season, with that in a field of corn or potatoes, will be struck with the scarcity of moisture in the former, compared to the latter.

PRUNING AND TRAINING.

This is an important topic. In giving advice upon this subject I am often tempted to say, "don't prune at all," with the exception of peach and plum trees. Nature has placed limbs on a tree, not alone for the purpose of providing fruit, but for the protection of the body as well, and to aid in carrying out the functions of the leaves (the lungs) which are as necessary to a tree as the roots. Yet a great many seem to think they know more about trees than the Great Maker of the universe, and consequently saw, hack and maim them, year after year, on the plea that they "grow too dense," and that the top should be open to light and air! Every limb cut off leaves a wound which requires from two to ten years to heal over. The cut part being exposed to heat and rain, dries, deadens and finally decays, and even after it has healed over, remains a sore spot, tainting the sap and assisting in the gradual destruction of the tree. Where a dead or broken limb must be removed the wound should be covered with a coat of grafting wax, shellac, or paint. A tree can and and should be trained without the use of a knife or saw, by attending to it in time.

In planting, the limbs ought to be shortened in, of course, to balance and shape the tree, but after that *rubbing off the sprouts* as they appear on the body or limbs, where none are wanted, and nipping off the tips of those limbs which it is desirable to keep in check. In this way a tree can be managed easier than where the limbs are first allowed to grow, and *then* cut off—a dead loss. The rubbing process leaves no wounds, and the tree is robbed of nothing which it has been taxed to produce. A tree can be trained like an animal, and if watched during the first few years, needs but little attention afterwards. Of the many orchards which I have seen, those which were never pruned contained the greatest number of well-shaped, even-sized, productive trees. In this connection I want to warn all novices in fruit-growing against accepting the services of a so-called *professional tree pruner*, for many are the orchards I have seen ruined by them.

NON-BEARING AND OVERBEARING.

The cause of unproductiveness in trees lies chiefly in the too rapid growth they are making, and in consequence the formation of fruit buds is imperfectly performed, the sap being mostly absorbed in the formation of wood. It is well known that an injury, or anything which retards or checks the growth of a tree, is apt to throw it into bearing. Therefore different expedients, such as cutting or hacking, boring holes, or driving nails into a tree, are resorted to, in order to force it to bear fruit, and although they often produce the desired result, yet they are dangerous, as they imperil the life of a tree. A better and safer method is to wind a thick wire, or a rope, tightly in six or eight coils, around the trunk of a tree, during the latter part of May, taking it off again in the fall. Over-bearing can be prevented, or at least remedied, by *thinning out.* This can be done by the aid of a rake containing four or five teeth set close, with which the superfluous fruit is pulled off, until enough only remains to make a fair crop. By thinning out, larger and better fruit is obtained, the enormous strain, and often irreparable injury and even death, is avoided. Trees on a decline, or on worn-out soil, if treated to a liberal application of wood-ashes, will thrive beyond expectation. Ashes produce a wonderful effect on feeble trees, causing a smooth, firm bark and luxuriant foliage.

THE APPLE-TREE BORER.

The parent insect deposits its eggs in May and June, and even later in the season, on the body of a tree near the surface of the ground, because there the bark is the most tender, and therefore best adapted to the wants of the tender larvæ. They should be looked for in July and again in September. By cutting away part of the bark where they entered, and inserting a thin wire, one end of which is bent to form a hook, they are easily drawn out. This method saves time and avoids mutilating the tree. Where woodpeckers are abundant they will aid considerably in ridding the orchard of these pests, if the soil is removed from about the tree, so they can get at them. It is best, however, to use preventatives. Of these the most simple and effective is the stiff paper commonly used in lining frame buildings, thoroughly saturated with linseed oil. This is cut in strips from fourteen to sixteen inches long, and wide enough to encircle a tree one-and-a-half times, and then tied with a string or wire near the top or bottom, first letting the lower end into the ground several inches. By cutting the paper two or three feet long, it will also serve to keep off rabbits.

Simple washes of lime, flour and sulphur, or carbolic acid, mixed together, or a thin application of home made soap, are also beneficial, but these must be applied often. In using soaps no hogs should be allowed to get near it, as they are fond of it and will bark the trees in their endeavors to eat the soap. These remedies must be applied in April, before the borer is at work. Keeping trees at a thrifty growth is also a preventative, as only the diseased trees, or those of insufficient vitality are attacked. No tar should be applied directly to trees.

SELECTION OF VARIETIES.

There are two errors which almost every novice in fruit growing, who plants for market, commits. One is the planting of *too many varieties*, which entails extra labor and expense in keeping them separate in packing, storing and marketing, or, if mixed, lessens the price.

The other mistake consists in planting too large a proportion of summer and fall apples. As a rule, summer and fall apples are not as remunerative as winter varieties, because they will decay faster and bear less handling, and therefore cannot be shipped to distant markets, while the culls are of less value for cider, or for evaporating purposes. Then, too, they come at a season of the year when other work claims one's attention, especially if farming operations are connected with fruit growing. Besides this, hired labor is more scarce and expensive during the summer than during the fall and early winter months.

APPLES.

The soil for these should be rich, and if it contains an admixture of clay and sand, so much the better. On moderate soil they will come into bearing earlier, but will not produce as large fruit, nor as much, nor be as long-lived, as in rich, deep soil. I have seen many orchards planted on poor soil, in some odd corner of a field, with the lame excuse that it "wasn't fit for anything else." What a short-sighted policy!

An apple orchard should have the best piece of land on a farm, because its product can be made to yield more revenue per acre than any other farm crop.

The crown or head of an apple tree should be formed not over three feet from the ground. It is a mistake to train them high enough to let a horse pass under them. The limbs should be low in order to protect the trunk and shade the ground. The orchard should be cultivated first two or three years and plant to corn or potatoes; then sow to clover, which is turned under and resown every two or three years.

For *family use*, the following list will give a succession the year round, and is proportioned to 100 trees:

Three Early Harvest, 3 Red June, 3 Sweet June, 3 Red Astrachan, 5 Maidensblush, 2 Sweet Bough, 2 Lowell, 3 Fulton, 3 Rambo, 3 Mother, 10 Jonathan, 3 Grimes' Golden Pippin, 2 Bailey's Sweet, 10 Huntsman's Favorite, 10 Rome Beauty, 15 Winesap, 12 Janeton, 5 Small Romanite, 3 Limbertwig.

For *market*, proportioned to 1,000 trees:

Twenty Early Harvest, 40 Red Astrachan, 40 Maidensblush, 100 Johnathan, 75 Huntsman's Favorite, 75 Rome Beauty, 75 Winesap, 500 Ben Davis, 75 Lansingburg Pippin. The latter is the longest keeper, of good size. If far from market, drop first three varieties, and add the amount to Ben Davis. Distance apart for trees, 30 feet.

PEACHES.

Peaches prefer a sandy, porous soil, and a high, open situation, the bluffs bordering large streams being best adapted to them. Cultivation same as for apples. The trees should be trained to low heads, starting a foot from the ground, and the limbs headed back every three years. This makes them more compact, and not so liable to be broken by storms or heavy crops. Varieties: Amsden's June, Early Louise, Froth's Early, Early York, Foster, Stump the World, Oto Mixon Cling, Salway, Steadley, Heath Cling. Distance apart, 20 feet.

PEARS.

A light, porous, deep soil is best. Cultivation is necessary only during the second or third years, to give them a start, when they may be sown to clover, timothy or orchard grass, the soil being left intact indefinitely. On poor soil, mulch. In rich soil, or when too highly stimulated by cultivation, blight is often the result, and may be attributed to the rapid, spongy growth of wood, ripening up late, and therefore unable to stand our sudden and severe changes of temperature. Clover or sod in a measure prevents this, by keeping the trees at a steady growth, and ripening up the wood early.

Standard trees last longer, while dwarf trees bear earlier. The former should be planted three or four inches deeper than they stood in the nursery; the latter only one inch deeper. Some varietie are less subject to the blight than others—notably the Seckel, Beurre d'Anjou and Winter Nelis. The best varieties are:

Beurre Gifford, Bartlett, White Doyenne, Seckel, Louise Bonne de Jersey, Flemish Beauty, Duchess, Beurre d'Anjou, Winter Nelis.

Distance for standards, twenty feet; for dwarfs, twelve feet apart.

CHERRIES.

Treatment same as for pears.

The Duke and Morrello class succeed best in the west. Of these I prefer:

May Duke, Early Richmond, English Morrello, Louis Philip, Large Montmorency, Late Duke. Sweet varities: Gov. Wood, Yellow Spanish, Black Eagle, Napoleon Biggoreau.

To prevent sun-scald, fasten a board on the south side of the tree, extending from the ground to the limbs. Distance apart, 20 feet.

PLUMS

Succeed in most soils, but only a few varieties will bear well, on account of the ravages of the curculio. They are best planted in the yard about a house. Varieties least subject to the curculio are: Chickasaw, Wild Goose, Miner, Louisa, Damson. Distance apart, twenty feet.

APRICOTS.

Treatment same as peaches. Varities: Early Golden, Moorpark, Breda.

QUINCES

Succeed best in rich, moist, but well-drained soil. Wet or poor clayey soils are to be avoided. They require regular cultivation, and should be treated for the borer the same as apples. As they are apt to throw out numerous sprouts near the ground, these shoots should be rubbed off, allowing but one body or trunk, as in other trees. The head should be formed within two feet of the ground. Salt and ashes sprinkled about the trees are beneficial. Best variety: Apple or Orange. Distance apart 12 to 15 feet.

The chairman at this point introduced Mr. Chubbuck, who gave in substance the talk on corn growing, reported at Oak Ridge, and printed in full further on.

At the conclusion of his remarks the following discussion took place:

Mr. Walker: "We fail in careful selection of seed, our corn is not uniform enough nor as uniform as might well be by more careful selection, even with small straight cob, straight rows, well tipped out, deep kernels and good length of ear, with early maturity and soundness,

should be selected, and early selected, and kept dry during the winter.

Questions by Mr. ———: Shall we not ridge while the corn is yet young, to get the warmth of the sun?

Mr. Walker: Ridging leaves the ground exposed to washing and is not to be commended.

Question by Mr. ———: Will not other plants mix with corn, for instance, pokeberry?

Mr. Walker: No.

Mr. Knox: I had white corn marked pokeberry red by pokeberry. So far as I could ascertain, the peculiar color, and absence of any cross in my corn, gives me assurance that the corn received a pokeberry cross.

Mr. ———: I have had such a case.

Question: Do moles eat corn?

Mr. Walker: No, the mole follows along the hills for bugs.

Mr. ———: I have put them in boxes with corn and I found that the corn disappeared, 28 out of 36 kernels.

Mr. Walker: It is possible that they may be starved into eating corn.

Mr. Hilber: Why do moles follow corn? I know that they eat corn.

Mr. Walker: They are carnivorous, and follow the corn row for bugs.

Mr. Chubbuck: Two students at the College Farm caught one and fed it in a box with corn and found it ate it, saw him eat it. I do not believe the mole likes to eat corn.

In answer to a question, Mr. Sanborn stated that dark seeds, by Dr. Sturdevant, were found to weigh more and sprout more vigorously than light colored seed. Also that he had found in corn, in a case investigated, that the dark colored seed weighed the most in proportion of seed to cob. Continuing, he said: "I think we plant too few hills to the acre and too few stalks. Four feet square, two stalks to the hill, one hundred ears to the bushel, gives but 52 or 53 bushels per acre, provided one good ear is averaged per stalk, which is all that is to be expected. I am now successfully trying to breed down the height of the stalk, and plant nearer together. I shall try three stalks to the hill and a nearer distance. In reviewing the trials of others I have found that their results teach that our distance of planting is too far."

FRIDAY'S SESSION.

President Walker opened the morning session with a few remarks regarding stacking straw and clover, and feeding, giving facts very much the same as reported for Oak Ridge.

Question by Mr. ———: Will it exhaust soil for clover to sow plaster.

Mr. Sanborn: Plaster will assist the growth of one or more crops of clover. Plaster is especially useful for clover, b ut it only aids in the more rapid impoverishment of the soil. This is permissible if the clover is fed and the manure returned.

Question: When would you sow clover?

Mr. Sanborn: In the spring. Sown in the fall it freezes out.

Several stated that they had no trouble with fall-sown clover.

Mr. ——: We sow timothy with it to hold it up.

Mr. Sanborn: Orchard grass blooms with clover, and is recommended to sow with it.

Mr. ——: How would you bring up soil without manure.

Mr. Walker: Not easily done without manure.

Mr. Sanborn: There are many make-shift methods of temporary use, that aid in rapidly decomposing the soil and increasing the crops for a short time, that leaves the soil poorer, unless the crops are fed on the farm, and the manure returned. Liming, plastering, salting, etc., are some of the ways justified, often, in mixed farming, where the crops are fed. I have brought up two farms in fertility, and am now trying a third, and have used many agencies. There is no royal road to permanent success short of actually feeding the soil with plant food in some form. Our cheapest method is found in mixed farming, where rotations, crops for farm consumption, and saving and applying manures, are prominent factors.

AFTERNOON SESSION.

Chairman Walker: I now introduce Levi Chubbuck, of the State Farm, who will give a short talk on wheat.

Mr. Chubbuck briefly reviewed wheat, historically, and then proceeded to discuss the conditions essential to its successful growth. A compact, but well-fined soil is essential; the finer the better, if only firmed after. Spring plowing and deep, to get compaction of rain and summer fallow; plowing shallow and rolling before seeding, was stated to give good results. If compressed, roots do not freeze out as much

and water runs off the surface. If saturated in a loose soil, it honeycombs and frosts lift the roots out more.

Shallow drilling was believed to be better than deep, to prevent injury of plant by frost.

The Acme harrow was praised by the speaker.

FRUITS AND HOME ADORNMENT.

BY CHARLES TEUBNER.

The above subject formed the topic of discussion after the close of Mr. Chubbuck's talk. The paper already given covers, in the main, the materials of the morning and afternoon talks.

FIFTY YEARS PROGRESS.

BY HON JOHN WALKER.

Mr. Walker spoke without notes. The lecture received the close attention of the audience throughout.

A synopsis of the speaker's remarks will be found in the report of the Higginsville meeting.

At the close of Mr. Walker's lecture a vote of thanks was tendered by the audience, after which the meeting adjourned *sine die*.

MEETING AT FAYETTE.

The fourth and final meeting of the board was held at Fayette April 7th.

The members present and addressing the meeting were, His Excellency, T. T. Crittenden, Hon. W. E. Coleman, Superintendent of Public Schools; Hon. John Walker, President of the Board; Hon. E. C. More and the secretary.

The meeting was held in the court-house in the afternoon. Room

was not afforded for all in attendance. Governor Crittenden reviewed the business expansion of the State during his administration. Hon. W. E. Coleman gave a strong presentation of the utility of education for the farmer, and the secretary presented a system of stock management for profit.

The evening session was held in the chapel of Fayette College. The house was well filled and the occasion made more enjoyable by the presence of the village band. To whom the board are indebted for the courtesy and generosity of this feature of the meeting the secretary is unaware. The session was addressed by the President, Hon. John Walker, the Secretary, Hon. E. C. More, and by Hon. W. E. Coleman.

FLAX CULTURE, WITH SPECIAL REFERENCE TO MISSOURI.

By H. Koelkenbeck.

Among the farm crops which are habitually produced in this State there is probably none which, if properly treated, would be as remunerative as the flax crop. There is absolutely no reason why this crop should not leave to the farmer a net profit of from fifteen to twenty-five dollars per acre, over and above the cost of production, whereas, now, alas, it often causes an actual loss to the farmer. During my prolonged stay in Missouri I have seen a good many flax fields so utterly overgrown with weeds that the owners thereof very wisely decided not to harvest them, (the crop would have consisted of at least seven-eights of weeds), but to plow them under and to try, as they said, to do better next year. Thus, their labor and outlay on these fields were utterly lost. It is not surprising that with such a result before them farmers declare that "flax raising does not pay."

But it is evident that such a deplorable result is by no means due to an inherent unprofitableness of the flax crop, but entirely to the following causes, namely: First, to the great carelessness of the Missouri farmer in the preparation of the ground, and his allowing it to be over-

grown with weeds; and, second, to the utter degeneracy and generally bad quality of the seed sown, apart from its being mixed with from 40 to 50 per cent. of impurities and noxious weed seeds. I might also mention that the small quantity of seed sown contributes not a little to the unproductiveness of the flax crop, but this subject will be treated under the head of "Seed."

Before, however, entering on my subject, I desire to show that flax cultivation was not always carried on in Missouri, and in the western States generally, in the same slovenly, careless manner as of late years, for very considerable quantities of flaxtow were annually received at St. Louis, to be turned into cotton bagging, twines, etc.; whereas the receipts of flaxtow at St. Louis had dwindled down last year to such an insignificant figure that this industry now appears to be nearly extinct.

The following figures, culled from the annual statement of the Trade and Commerce of St. Louis, for 1883, reported to the Merchants' Exchange of St. Louis, show the gradual decline of production of flaxtow, which is now entirely superseded by jute in the manufacture of bagging, although, *flaxtow* not only could be produced more cheaply than jute, but would also be preferred by the manufacturers to the latter raw material for the above purpose.

The receipts of flaxtow at St. Louis were, during the following years, viz:

1876, 5,016 bales; 1877, 9,546 bales; 1878, 26,976 bales; 1879, 9,480 bales; 1880, 10,475 bales; 1881, 5,060 bales; 1882, 1,344 bales; 1883, 294 bales.

I have good reason to believe that of late years no flaxtow at all has been produced in Missouri, and that the quantities received at St. Louis came from Iowa, Minnesota, and other northwestern States.

Although, in the absence of agricultural statistics, it is impossible to give even an approximate idea of the extent to which flax is cultivated in Missouri, the flax area having been variously estimated at from 30,000 to 100,000 acres, I believe that the correct figures, if it were known, would not fall below 50.000 acres. This considerable acreage, if properly cultivated, would produce at least one and a quarter million of dollars annually, in seed and in fiber, whereas, from the causes mentioned above, the average value of the flax crop in Missouri is certainly not more than $6.00 or $7.00 per acre.

There is, therefore, much room for improvement in this branch of husbandry, and in order to contribute to the promotion of flax culture and the production of the highest value, both in seed and fiber, the following short outline of this interesting culture has been written

with a hope that Missouri farmers will in the future devote greater care to this crop, both in their own interest and in that of the country at large.

SOIL.

Flax culture requires very careful preparation of the land, deep tillage and thorough pulverization being essential to success. By careful attention to these prime requisites flax may be profitably grown on any soil, although all are not equally adapted to this crop. The best soil for flax is a good alluvial or vegetable loam, equally removed from a loose sand or tenacious clay. Flax will not do well if the land be wet, nor upon heavy clay soil, unless thoroughly underdrained, well pulverized and enriched with manure. It is no more reasonable to expect to raise a good crop of flax from a poor, wet, half cultivated soil, than a good crop of wheat. A good wheat soil is generally suitable also for flax.

Peaty soil, destitute of a clay bottom, also sandy land with a gravelly bottom, should be avoided, as only a scanty yield and inferior fiber can be expected from a crop grown under such unfavorable conditions.

A rich sod which has long lain in pasture or meadow, well plowed and rotted, is the best for flax and will be sure to make a profitable return.

MANURES.

The use of fresh barn-yard or stable manure is to be avoided, principally on account of its containing weed seeds, which have not yet germinated, and they should in all cases where necessary, be added to the preceding crop. Ashes from the burning of heaps of brush and rubbish are highly beneficial. Solid manures should only be added to the land after being thoroughly composted and rotted. Salt, ashes and gypsum, are proper manures for flax. The last kind has the greatest effect if applied after the plant is developed and while covered with dew or moisture. All the saline manures used as a top dressing benefit the plant and check the ravages of worms which frequently attack the young plant.

It is also of importance that the manure be applied evenly to the land; whenever the manure is applied unevenly the crop exhibits irregular patches which are more vigorous than the average, and therefore the product is of unequal length, which is an injury to the fiber.

One method of avoiding the difficulty is to apply the manure in liberal quantities to the preceding crop, applying none to the land the season of the flax crop. Another is to put on the manure in autumn or winter, so that it may become thoroughly amalgamated with the earth by the action of the elements previous to the sowing.

Commercial fertilizers have the advantage of being free from seeds of worthless and noxious plants, and without doubt can be used on flax with profit; but this class of manure should be used with caution and with an accurate knowledge of the constituents of the land to which they are applied, as well as of the fertilizer itself. The prudent farmer will, as far as practicable, produce on his own farm the manure necessary to keep up its fertility.

PREPARATION OF THE SOIL.

Weeds may be properly regarded as the worst enemy of the flax crop. They not only appropriate from the soil much of the nutrition required by the flax plant, which is a great injury even when the crop is raised solely for the seed; but they are chiefly injurious when flax is grown for the fiber, because in harvest time the flax stalks get so entangled with weeds that it is impossible to separate them, and thus the value of the straw is seriously impaired. The necessity of clean culture, therefore, is at once apparent.

The preparation of the land intended for flax must be governed mainly by the character of the soil. A light plowing immediately after harvest is essential upon all soils; but if the ground be heavy and stiff it should be laid in ridges before the winter sets in, and so remain until some two or three weeks before sowing time, when it should be deeply plowed. Light soils may have their last plowing before the ground is frozen up for the winter. Medium soils may require a second plowing, which should not be less than a month previous to sowing. This second plowing of medium and heavy land should be shallow, not exceeding four inches in depth. The soil should be sufficiently loosened and mellow to allow the roots to penetrate about one-half as far into the ground as the stem reaches above.

Strong soils and such as are coarse and wet are usually cross-plowed before winter. Where flax follows clover, the land which has been enriched with barn-yard manure or peat ashes receives in autumn a like quantity of the same manure, which is covered with the plow and well harrowed to make the soil mellow. In spring a vigorous harrowing is given and the seed is sown.

When flax is to be sown in potato ground, it need only receive one shallow plowing, say four inches deep; and if the soil be light,

this should not be done until a month or six weeks before sowing. But if the soil be heavy it would be beneficial to have it done earlier, so as to expose the ground to the pulverizing action of frosts.

When seed time arrives, should such weeds as dock, sit-fast, couch-grass or any other appear, they should be exterpated *previous to harrowing*. After this is done, harrow thoroughly; if in ridges, lengthwise only; if level, cross-harrow also. The objection to cross-harrowing when the land lies in ridges is that it drags soil into the furrows and leaves a loose bed for the seed. When the land is well drained, or naturally dry, I would recommend flat cultivation, by which more even growth is secured. This is especially important when flax is grown for the fiber. Where there are furrows in the field, that portion growing along these depressions will not be as strong and vigorous as the rest of the crop.

It is well to keep in mind that the important thing in preparing the soil is to have a *fine*, *deep*, *dry*, *firm* and *clean* bed for the reception of the seed. The soil should be so open that there may be free percolation of water; and also where open on account of the roots being very fibrous and extending both laterally and vertically to a considerable distance.

SEED.

It need hardly be stated that the selection of seed is a matter which is entitled to special consideration, as the success of the crop depends to no small extent on the quality of the seed. Flax seed is considered of good quality when it is bulky and heavy, the faces of each seed being equally plump and convex, color, a bright brown, uniform, should sink in water, and be easily combustible, burning with clearness and rapidity. The inside, when broken, should be of a light, yellowish-green color, should have a sweet taste and be very oily. Only fresh seed is suitable for sowing. If it is more than two years old, it should always be *tested* as to germinating power before regarding it as wholly reliable. This may be done in the following manner: Place a certain number of grains between two thin pieces of sod-laid earth, sides together, and put on a shelf in the kitchen where they may be kept warm and not allowed to dry. In a few days every seed that has not lost its vitality will germinate. Then by counting them we readily ascertain what proportion are good.

Special care should be taken to clean the seed of all weed seeds and other impurities which will otherwise infest the land and cost

much labor and expense in weeding them out if ever got rid of. The cleaning may be effected by a wire sieve, twelve meshes to the inch, costing about seventy-five cents; or, if a large quantity is to be cleaned, by a fanning mill having sieves of the above description.

Right here, let me say that none but the best and purest seed should be procured for sowing, regardless of price. It is false economy and most wretched management unworthy the intelligent farmer of the period, to buy low priced seed in order to save a few dollars, thereby running the certain risk of producing a crop which will barely cover the cost of the production. It may be safely asserted that at least four-fifths of the flax seed annually sown in the Western States is entirely unfit for the purpose of reproduction, hence the miserable and unremunerative crops which are generally produced. The oil mills and seed dealers who loan to the farmers the seed necessary for sowing, have been pursuing for years a very short-sighted and suicidal policy by loaning their worthless and impure seed, often adding the qualification of "Russian," in order to deceive the farmer, for I assert that no such seed has ever been imported by them. I may also state here that no seed more easily degenerates and loses its power of reproduction than flax seed. For this reason new seed from other countries is imported for the purpose of sowing in the principal flax growing countries of Europe, such as Ireland, Belgium, Germany, France, etc. Even Holland, whose seed is highly esteemed for its superior quality and great purity, likewise imports her sowing seed from Russia, and sells her own seed at remunerative prices to her neighbors. Thus a regular and constant interchange is taking place in these countries. Experience has demonstrated that by this means the best crops are produced both in respect of seed and fiber. It is, therefore, a matter of vital importance, especially in the Western States, that there should be a radical change inaugurated in the character of the flax seed used for sowing in this country. This cannot be done too soon. Thus only can flax culture be reclaimed from the lamentable state of degeneracy into which it has fallen. Let farmers, therefore, entirely abandon the system they have followed hitherto, of *borrowing* their sowing seed from the oil mills or seed dealers, and procure their seed from the St. Louis or Chicago seed houses, which will furnish them pure seed of superior quality; and, although they may have to pay a higher price for such seed, they will be amply compensated for the larger outlay by a remunerative harvest.

The system of seed loaning has also lead to a practice most injurious to the crop, and, hence, is unsatisfactory in its results, namely, *thin sowing*. The seed loaners, in order to cover with the smallest quantity

of seed the largest possible area, have persuaded farmers who engage to deliver their seed crops to the above parties, that thin sowing is productive of large crops, and that half a bushel of seed per acre is sufficient to produce a good crop. Now, while it is quite true that when flax is grown for the seed only, it should be sown thinner than when the production of fiber is the chief object. The above quantity is altogether insufficient for producing a good crop, and when I further assert that almost *all* the seed loaned or sold to the western farmers contains from forty to fifty per cent. of weed seed and impurities the quantity of genuine flax seed sown it is seen in reality is only a quarter of a bushel per acre, and part of this has often lost its germinating power. Long experience in the Eastern States and in Europe has conclusively demonstrated that at least one bushel of good pure seed per acre should be sown if we would produce a satisfactory crop. It may also be pointed out here that through the absurdly thin sowing, coupled with the impure seed, the immense quantity of weeds are produced which characterizes the western flax fields, and which are not to be met with in any other part of the world.

HOW TO SOW.

After the land has been carefully prepared according to the instructions given, and after removing all the stones (except the small ones which will do no harm) it will be well to give it a final harrowing and rolling before putting in the seed. The object of this is to have the surface of the ground as smooth and level as it can be made, so that the flax may get an even start and grow uniformly in order that the harvesting may be facilitated (if a mower and self-binder are employed), and also to secure the greatest length of straw by cutting low to the ground. If the sowing is done upon an uneven surface, where there are lumps, clods, furrows and holes much of the seed will be covered too deeply, and consequently the growth of the straw will not be uniform, nor will the seed mature at the same time. If there are no lumps, however, the roller need not be used. But the ground should be gone over with a harrow having numerous small teeth. Where the soil has been cultivated as it should be for the preceding crop of Indian corn, potatoes or barley the surface will be as mellow and free from lumps as a neatly prepared carrot bed. On such soils, with selected seed, flax will grow from three to four feet in length, the seed will be abundant and of superior quality, and the lint will be heavy and of good length.

Sow on a rolled surface and while it is still fresh, because flax, like other seed, will more quickly germinate under such conditions than if

put into soil that has lain undisturbed for a number of days. A favorable time is when the weather is calm and dry, if shortly after a shower all the better, when the lumps of dirt will crumble at a very slight touch, and the entire surface is friable and mellow. Then the seed, germinating in a few days, will get the start of weeds and easily keep the ascendancy throughout the period of growth. By this means much weeding will be saved, and the fiber be more abundant, the seed of better quality, and the yield of both products be greater. As flax seed is much more difficult to sow than most other kinds of seed on account of being so very slippery, it is very important that, if the sowing be done by hand, an experienced sower should be employed. It is of prime importance that the seed be sown evenly, and doubtless this can be accomplished more readily and surely by the use of a broadcast seed sower, one of the inventions of late years, which will insure more even sowing than can be done by hand. Another advantage offered by these implements is the large acreage which can be sown in a short time. The saving in labor thus secured is very large, and there is a material saving also in the quantity of seed required. When, however, hand sowing is to be employed especial care should be taken to sow as evenly as possible, the sower proceeding with a regular step, taking small, tight handfuls, and casting the seed high and fearlessly, allowing each cast to slightly overlap the preceding one. If not careful the slippery seed will escape in the backward swing of the hand, and thus not only waste but render the seeding irregular. Some cultivators advise soaking the seed in tepid water for two or three days, and then rolling the same in gypsum or plaster. This remedies the slipperyness, and the gypsum is beneficial in effect upon the germinating seed.

It may be suggested that if the farmer intends sowing a large acreage to flax it will be well not to do all the sowing at one time, but at an interval of a week or ten days, in order that time should be given to harvest before parts of it get over-ripe.

COVERING SEED.

The seed should not be covered too deeply. One inch of soil is sufficient, and it should be as uniformly of this depth as possible. A light, fine-tooth harrow is best adapted to this work. It would be best not to allow a team of any kind to be driven over the land after the seed has been put in, but draw a brush harrow by hand over the soil. Such a harrow can be readily made by inserting the butt ends of brush (small branches of trees) about two feet long in holes bored in a piece of scantling, which shall be about five feet in length. To this scantling shafts or handles may be fitted, so that the harrow can be drawn

by a man or a boy. With this "harrow" several acres can be brushed in in a day. It would be well also to cross-harrow the land with this brush so that no ridges will be left and the land may be uniformly smooth. The effectiveness of such a brush may be increased by adding to its weight a few billets of wood fastened to the scantling which holds the brush in place. Rude as is this novel implement it will be found most efficient for the purpose of properly covering the seed. Where the acreage is large, however, a light harrow drawn by horses will, of course, be the most practicable.

WHEN TO SOW.

No invariable rule can be given as to this, much depending on the peculiarities of the season. It is, however, advisable to sow as early as possible, on account of the drouth and great heat which generally come on later in the season, by which the flax is stunted in its growth. On the other hand, it is well to avoid the late spring frosts, which would injure the tender plant. If the season is favorable, the sowing should take place in the beginning of April, when, as a rule, the soil has become settled and thoroughly warmed by the influence of the sun. The flax grower must, however, to a great extent, be guided by his own experience and observation in his own section as to the right time of seeding.

ROTATION.

Neglect of the important matter of rotation has been to a great degree the cause of the diminution of yield per acre of nearly all farm crops in the Western States, but this remark is especially applicable to flax. This crop should never be sown successively on the same field. There should be an interval of from six to eight years between crops, so that the land under cultivation may regularly receive back from the different manures applied, a portion of the special nutritive elements of which it is depleted by the flax, and after the interval specified be enabled to feed another similar crop without any artificial recuperation of the soil. Flax should never follow turnips. It has been shown by repeated experiments in Europe that such a rotation is sure to result in failure. The following diagram is introduced merely for the purpose of illustrating a judicious rotation of crops under cultivation. It is assumed that a portion of the farm is undergoing the necessary renovation by lying in pasture for some years. No arbitrary rules can be laid down for rotation. The intelligent farmer should be best qualified to judge of the proper course to follow upon his own

farm, the peculiarities of which he is fully acquainted with. The suggestions here made, however, may serve to guide him in this respect.

Years	Crops.	Years
1	Turnips..... | Potatoes or corn.....	
2	Wheat or oats..... | Flax.....	1
3	Clover or grass.....	2
4	Rye, oats or barley.....	3
1	Potatoes or corn..... | Turnips.....	4
2	Flax..... | Wheat or oats.....	5
3	Clover or grass.....	6
4	Rye, oats or barley.....	7
1	Turnips..... | Potatoes or corn.....	8
2	Wheat or oats..... | Flax.....	9

ACREAGE TO SOW TO FLAX.

This depends entirely upon the farmer' ability to thoroughly work the land, and keep it in the highest state of cultivation, which is really the basis of successful flax farming. There is no farm crop for which the soil needs so thorough preparation as that required for flax; nor is there any crop that will give better returns for the cost and labor of fertilizing the soil, and keeping it clean of weeds. The farmer, therefore, must count the cost himself, and, with his eyes open to the necessities of the case, use his best judgment as to the acreage he can profitably donate to the flax crop in order to secure the highest yield both of seed and fiber.

WHEN TO HARVEST.

When the lower part of the stems begin to turn yellow, and the leaves fall off for ten inches from the ground; when the seed capsules are formed and the seeds begin to change in color from green to pale brown, then is the proper time for harvesting the crop.

Discriminating judgment is required that no mistake be made on this point. If harvested prematurely, the fiber will be weak and there will be loss both in quantity and quality. If the flax be left standing until fully ripe, the fiber will be coarse, brittle and diminished in quantity. As for the seed, experience has amply demonstrated that

most seeds, though not quite matured when gathered, ripen fully afterwards, provided they are not separated until completely dry, from the plant, for the sap still contributes to the further nourishment and perfection of the seed.

If, in sowing the crop, the acreage has been divided by an interval of several days, as has been remembered, harvesting in good condition will be easily accomplished, as that portion which ripens first may be taken care of before the balance of the crop has matured, and so no part of it will be over-ripe.

HOW TO HARVEST.

Harvesters with twine-binders have now come into general use in this country, and may be so adjusted as to cut the flax quite close to the ground. This should be done in order to secure the largest quantity of fiber, a matter which has hitherto failed to receive the consideration its importance demands, at least in the west, where, annually, hundreds of thousands of tons of flax straw are burned or left to rot in the field.

But there is good reason to hope that the time is near when every pound of this valuable raw material will be utilized, and thus millions of dollars added to the farmers' treasury. It is, therefore, of very great importance that they should henceforth bestow more care to this hitherto so neglected a crop, so that more straw and less weeds may be produced; thus the value of the crop can easily be doubled.

HOME PRODUCTION OF SUGAR.

THE IMPORTANCE OF THE SORGHUM CROP OF MISSOURI.

BY N. W. WILEY, CHIEF CHEMIST.

U. S. DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

CORRESPONDENCE.

COLUMBIA, MO.,
May 28, 1884.

Prof H. W. Wiley:

DEAR SIR: If sorghum is to succeed, I imagine that Missouri is climatically finely situated to become one of the most important of sugar producing States. We desire to stop our distructive corn and wheat sales to Europe. I would be very much gratified if you would furnish for our coming roport a review of the business prospects of sorghum for sugar. That is, can you advise our farmers and business men to invest in this crop? If so, why? Butter, fibres and sugar, I want our people to take hold of if they promise. Please give me an early answer, as I wish to secure such an article as described.

Very respectfully,
J. W. SANRORN, Sec'y.

DEPARTMENT OF AGRICULTURE, CHEMICAL DIVISION,
WASHINGTON, May 28, 1884.

J. W. Sanborn, Columbia, Mo.:

DEAR SIR: I will take pleasure in preparing a short report, such as you suggest in your letter of the 23d inst.

The reliable information to be had on such matters is somewhat fragmentary, but I will do the best I can.

Respectfully,
H. W. WILEY, Chemist.

AMERICAN SUGAR INDUSTRY FROM AN ECONOMIC POINT OF VIEW.

In every industry one question takes precedence of every other, i. e., will it pay?

It is not that from the first and always an industry should be self-supporting, but it is important that in the end and generally it should be remunerative.

Happily, individuals and governments are willing to make experiments with new industries and new processes. Happily, too, a loss of money at the first and afterwards does not always bring discouragement and abandonment. But, if, after years of fair trial, no reward is obtained and none promised, it is the part of wisdom to suppress any further attempt.

Among the many questions of economic importance in this country, the one which relates to our sugar supply is among the most weighty and urgent.

We are a sugar eating people.

The consumption of sugar per head in the United States, during the last year, was not far from 45 pounds. For 55,000,000 people this amounts to two billlon four hundred and seventy-five million pounds. Even at the low rates at which sugar is now selling, the total cost is enormous. We can safely estimate the last cost, i. e., the retail price, at 8 cents per pound. The expense per person is, therefore, 45 X .08 equals $3.60. The total expenses of our national government are less than $250,000,000 annually, or only about $4.50 per inhabitant. It is thus seen that the cost of sugar to our people is but about a dollar per head less than the taxation for national purposes. This does not include the cost of molasses.

The amount of molasses imported into the United States for 1883 was in round numbers thirty million gallons.

The quantity of molasses produced in Louisiana in 1882-'83 was 15,716,755 gallons.*

Of the foreign molasses, coming mostly from Cuba and the other West India Islands, the greater part is reboiled, producing a second crop of sugar crystals. The molasses from the second crop is used either by the distillers or sent to England, where it is used for table purposes under the name of "trevele."

But what is lost in this way is more than repaid by the manufacture of glucose syrup.

*Louisiana Sugar Report, 1882 3, p. 54.

These syrups are made by mixing the colorless glucose with enough of the sugar house molasses to give it color and flavor suitable for the table.

The quantity of glucose manufactured in the United States is hard to estimate. Manufacturers are reticent as regards the magnitude and details of their business. Fortunately, however, the number of glucose factories is not large and their capacity pretty well known. The quantity of liquid glucose made in this country annually is probably not less than thirty million gallons, each bushel of corn making from two and one-half to two and three-fourth gallons of glucose.

Fully two-thirds of this is used in the mixing trade, and therefore the quantity of glucose syrups made and consumed is certainly not less than twenty million gallons.

Another source of molasses is the one which chiefly concerns here, viz., *sorghum*.

In sorghum the collection of accurate data is quite impossible. Unlike glucose, sorghum is made at thousands of different places and in small quantities. The number of sugar factories in Louisiana is only about one thousand, but who can enumerate the sorghum mills that dot the landscape of the whole country? I doubt whether there is a State or Territory in the Union where they are not found.

But, thanks to the industry of a few collectors of statistics, we are able to give a fair approximation of the yield of sorghum syrup during the last year. It will be safe to put this at 15,000,000 gallons. This is certainly not an over-estimate.

TOTAL MOLASSES AND SYRUPS CONSUMED IN THE UNITED STATES

	Gallons.
Of foreign importation	10,000,000
Produce in Louisiana	15,000,000
Made from Sorghum	15,000,000
Made from Corn Starch	20,000,000
Total	60,000,000

To this we should add the product of the maple forests, which, although not large in amount, is yet important. We have, then, in all, not less than sixty-one million of gallons entering into consumption, or a little over one gallon per inhabitant.

The average retail cost of these syrups to the consumer is not less than fifty cents a gallon or $30,500,000. Add this to the retail cost of sugar, viz., $188,000,000, and we have the total $218,500,000 as the actual cost of sugar and molasses to the consumers of our country. This is a figure which may well cause us not only to wonder, but also to study carefully the economic side of the problem.

SUGAR SUPPLY IN OTHER COUNTRIES.

In order to have a proper idea of the sugar industry of our country, it is necessary that we look at other lands.

BEET SUGAR PRODUCTION OF EUROPE FOR THE FOUR PRECEDING YEARS. *

COUNTRIES.	1883–84. Tons.	1882–83. Tons.	1881–82. Tons.	1880–81. Tons.
Germany	940,000	848,124	644,775	594,223
France	465,000	423,194	393,269	333,614
Austria Hungary	445,000	473,002	411,015	498,082
Russia and Poland	310,000	284,491	308,779	250,000
Belgium	305,000	82,723	73,136	68,626
Holland and other Lands	40,000	35,000	30,000	30,000
	2,305,000	2,146,534	1,860,974	1,774,545

* *La Sucrerie Indigene et Coloniale*, No. 16, vol. 23, p. 385.

The above figures are official, save for the last year, but the estimates are within, at most, two or three thousand tons of the figures which the official report will show as soon as published. The production of cane sugar is much more difficult to determine with accuracy. At best, only estimates of it can be given. The crop of 1881 is estimated by Mr. H. A. Brown* at 4,900,000 tons, distributed among the various sugar-producing countries as follows:

*Collier's "Sorghum," p. 545.

Countries.	Tons.
British India	1,500,000
China, Hong Kong, etc	1,000,000
Cuba and Spanish Possessions	750,000
British West Indies, Demerara, etc	250,000
Dutch India, Java, etc	250,000
French West Indies, Guiana, etc	175,000
Brazilian Empire	175,000
Mauritius Reunion, etc	150,000
Vanella, Philippine Islands	135,000
Louisiana, Texas, etc	125,000
Egyptian Provinces	75,000
Peru, South America	75,000
Hawaiian Islands	45,000
Mexico	35,000
All other countries	160,000
Total cane sugar	4,900,000

Allowing for a reasonable increase during the three years which have passed since this estimate was made, we may now safely place the world's product of cane sugar at 5,000,000 tons. The yield of maple and sorghum sugar is now too small to have any place in the total estimate of the product of the world, which is therefore the sum of the beet and cane sugar numbers.

This sum amounts to 7,305,000 tons!

This sum shows that the sugar industry of the world occupies no mean portion of its capital or labor.

I will return now to a more minute discussion of the sugar industry of the United States, with special reference to the production of sugar in the north from the beet and sorghum.

SUGAR PRODUCT OF LOUISIANA.

The indigenous sugar* consumed in this country is derived from four sources, viz: (1.) The sugar cane, growing chiefly in Louisiana. (2.) The beet, growing chiefly in California. (3.) The maple, growing chiefly in New England, New York and Ohio; and (4), the sor-

*I speak now only of *sucrose*, which is the sugar of the sugar cane, maple, beet and sorghum.

ghum, growing over the entire area of maize production. Of these sugars, the only one of any commercial interest at the present time is that from the sugar cane of Louisiana.

I append a statement of the product of sugar in Louisiana, from 1823 to 1882*.

STATEMENT OF CROPS FROM 1823 TO 1883.

Crop of 1882	241,220 Hhds.	Crop of 1857	279,697 Hhds.
1881	122,982 "	1856	73,296 "
1880	218,314 "	1855	231,427 "
1879	169,972 "	1854	346,635 "
1878	218,221 "	1853	449,324 "
1877	127,758 "	1852	321,934 "
1876	169,331 "	1851	237,547 "
1875	144,146 "	1850	211,201 "
1874	116,867 "	1849	247,923 "
1873	89,498 "	1848	220,000 "
1872	108,520 "	1847	240,000 "
1871	128,461 "	1846	140,000 "
1870	144,881 "	1845	186,000 "
1869	87,090 "	1844	200,000 "
1868	84,256 "	1843	100,000 "
1867	87,647 "	1842	140,000 "
1866	41,000 "	1841	90,000 "
1865	18,070 "	1840	87,000 "
1864	10,387 "	1839	115,000 "
1863	76,800 "	1838	70,000 "
1862	no date "	1837	65,000 "
1861	459,419 "	1836	70,000 "
1860	228,753 "	1835	30,000 "
1859	221,840 "	1834	100,000 "
1858	362,296 "	1833	75,000 "
1832	70,000 "	1826	45,000 "
1829	48,000 "	1825	30,000 "
1828	88,000 "	1824	32,000 "
1827	71,000 "	1823	30,000 "

*Louisiana Sugar Report, 1882-3, (P. XLIV.)

It appears from the above that the product of sugar in Louisiana during the last twenty years has not increased. There have been, it is true, great fluctuations in the yearly yield, but these have been due solely to the seasons, and not to any permanent cause.

I am far from believing that Louisiana is not capable of yielding far larger crops than the last few years show. There is no reason why, with a favorable season, the phenominal yield of 1860–61, should not be duplicated. But I will not stop to discuss here the causes, political and agricultural, which have prevented the increase in the sugar product in Louisiana, which the march in the country in wealth and industry would naturally have produced.

PRODUCT OF MAPLE SUGAR.

As I have previously intimated, the product of maple sugar is not large enough to become a commercial factor of any importance. Yet, in an economic discussion of the sugar question, it would not be fair to leave it out of the account.

It is quite impossible to collect accurate statistics of the yield of maple sugar in this country. The vast forests of maple trees which, fifty years ago, covered so large an area in Ohio and Indiana, have almost entirely disappeared. The pioneers of those States were not slow to learn that the maple and the black walnut were always found occupying the richest soils, and hence the maple and the black walnut have suffered most severely of all the forest trees from that frightful arborean mortality which has been experienced in this country during the last ten decades. It is to be hoped that the wise conservatism of the present, may in some degree secure the restoration of the forests, which the natural radicalism of the past has destroyed. But this restoration, at best, will come but slowly, and so, for many years to come, maple sugar will continue to be eliminated from the economic problem. In New England the maple trees have taken refuge among the hills, and their sanctuary has been respected. At best, however, only an estimate of the total product can be made. From the most reliable data at hand it appears that, in round numbers, forty million pounds will be a fair statement of the average annual product of maple sugar. If the Department of Forestry had commenced its good work fifty years ago it is safe to say that the annual product of maple sugar, now, would be fully one hundred thousand tons. This would be an amount which would make itself felt in the markets of the country.

BEET SUGAR.

The beet sugar industry of the United States was elaborately discussed four years ago by Dr. McMurtrie, in a "Special Report No. 28," of the Department of Agriculture. In this report especial attention was given to the climatic conditions favorable to the growth of the beet. This report conclusively shows that the area of the United States in which the sugar beet can be successfully grown, is confined to a narrow belt along the northern border of the Union, and to northern California, Oregon and Washington Territory.

The experience of the last four years has shown that the Pacific States are best suited to the sugar beet industry. The continued success of the factory at Alvarado, California, is a very gratifying evidence that the Pacific States, at least, will soon be independent of foreign sugar and Claus Spreckles. This factory, during the past campaign, produced a million and a quarter pounds of sugar, the beets showing a yield per ton which will compare favorably with the best beet sugar areas of Europe.

At present the California factory is the only one in operation in the United States. Another factory is in operation at West Farnham, Canada, and these two are the only ones in use in North America.

It is evident, therefore, that the product of beet sugar is not yet large enough to become an economic factor of any importance. I look, however, to see a rapid development of this industry in the Pacific States.

PRODUCT OF SORGHUM SUGAR.

The amount of sorghum sugarm anufactured in the United States, during the season of 1883, is as follows:

	Pounds.
Rio Grande, N. J.	282,000
Champaign, Ill.	160,000
Sterling, Kans.	136,000
Hutchinson, Kans.	131,000
Ottawa, Kans.	7,000
Department of Agriculture, Washington, D. C.	10,000
Total	726,000

This does not include the many small quantities of sugar made by the manufacturers of syrup—mostly against their will. There is no way of learning just how much sugar crystalized in this way, but in some instances it was enough to spoil the sale of the syrup. But the season was an extraordinarily unfavorable one, and it is hardly fair to judge the industry by the data which it furnished.

But one thing, respecting the sorghum sugar industry, has been learned during the past few years, *i. e*, that all expectation of successful sugar making from sorghum far in the north must be abandoned. Sorghum sugar cannot be successfully made north of those localities, which by late frosts and a mild October, permit a manufacturing season sufficiently long to dispose of the crop.

Having lately discussed the sorghum problem in detail, *I refer any one further interested in it to that report.

The foregoing figures and facts will now supply a reliable support for a more purely economic study of the sugar problem, in its relation to agriculture and the other industries.

AGRICULTURE.

In favorable circumstances, we may say that each acre in cultivation for sugar will yield one thousand pounds. In Louisiana the yield is indeed much greater. The sugar beet is also a plant that will produce much more than a thousand pounds per acre; but at the present time sorghum does not yield so generously, and therefore the estimate which must include sorghum should be placed within reasonable bounds.

I do not doubt but that in the near future improved culture, and especially improved methods of manufacture, will greatly increase the average yield per acre.

Since the sugar consumption of the country is 2,475,000,000 pounds, the acreage required to furnish the supply would be 2,475,000.

Land suitable for sugar culture will command at least $5 per acre rent. The value of the rental of the sugar land is therefore $12,375,000.

The cost of cultivation will be found very nearly expressed by the following figures:

*The Northern Sorghum Industry U. S. Department of Agriculture, Chemical Bulletin, No. 8, Washington, D. C.

Plowing per acre	$1 50
2 harrowings at 30 cents	60
Planting, etc.	80
Cultivation	1 75
Sum	$4 65

For 2,475,000 acres, the total cost of crop to time of harvest is therefore $11,708,750.00.

The estimate which I give for harvesting and delivering crops at factory are less reliable and would vary greatly in different localities. I will try and make it however as fair as possible.

For harvesting and delivering at mill or depot, $9 per acre, which for 2,475,000 acres amounts to $22,275,000.00.

RECAPITULATION.

Rent of land	$12,375,000
Cost cultivation, etc	11,708,750
Cost of harvesting, etc	22,275,000
Total	$46,358,750

I think this estimate is under, rather than over the truth, and to make it more easily comprehensible, I will place it at one dollar each, for the total population of the country.

It will be seen that an industry which requires nearly fifty million dollars a year, in pure agriculture, representing as it does fifty million days' work, is one which demands the serious attention of students of rural economy.

MANUFACTURE.

For a proper conduct of the process of manufacture, I have estimated from a careful study of details, that $50,000 will have to be invested in machinery, etc., for each 1,000,000 pounds output of sugar. Therefore for two thousand four hundred and seventy-five million pounds, the total investment in permanent capital would be $123,750,000.

The cost of manufacturing the sugar, not including cost of raw material, but including wear and tear of machinery, will be about 2 cts. per pound, or a total of $49,500,000.

For the raw material, *i. e.*, canes and beets, the cost will be fully 2 cts. per pound of sugar produced, or in round numbers $50,000,000.

SUMMARY OF MANUFACTURING.

Capital invested	$123,750,000
Expenditure for labor, fuel and supplies	49,500,000
For raw material	50,000,000
Total distribution	$99,500,000

It is probable that in the above estimates too much has been allowed for cost of manufacture, and too little for raw material. I hesitated long in making the estimate, and still feel that I might have come nearer the truth by allowing 1½ cent. for manufacture, and 2½ for for raw material, giving for the above figures, without changing the total, $37,125,000 for cost of manufacture, and $62,375,000 for that of the raw material. This showing would be still more favorable for the agriculturist.

TOTAL MOVEMENT OF MONEY ATTENDING HOME SUGAR PRODUCTION.

Paid for crop delivered at factory	$46,858,750
Paid for raw material	62,375,000
Paid for cost of manufacture	37,125,000
Total	$145,858,750

This figure represents the value of the home sugar industry.

MUTUAL DEPENDENCE OF THE INDUSTRIES.

A study of the foregoing figures reveals the fact that, from an economic point of view, this county would be benefitted to the extent of more than a hundred million of dollars by securing the home production of sugar.

While the press and the statesmen of this country are discussing the best methods of increasing our foreign trade, they should not forget that the home trade is of far greater significance; but the benefits

to be derived from the home production of sugar are not those alone which have been mentioned.

True prosperity cannot come to a country without a diversified industry.

One of the best ways to foster the agricultural interests of the country, is to build up through all parts of it other industries, mutually dependent and mutually helpful. Thus it happens that the greatest agricultural prosperity is found in those States in which the manufacturing and carrying industries are most fully developed.

The farmers in the vicinity of large manufactories are always more prosperous than those far removed therefrom. The reasons for this are so plain that it would be needless here to enter into a discussion of them. Further, the co-equal development of the industries secures, better than any other means, the development of small farming, the ultimate hope and base of all prosperous agriculture.

The small farms are found clustered about the factories, while the huge ranches, fostering monopoly and hindering settlement, are innocent of the coal soot of the factory. The agriculture of the future in this country must be the agricuiture of the small farmer, who owns his farm, and not of the peripatetic tenant who seeks simply to exhaust it.

The genius of our free institutions will not permit the accumulation and transmission of vast landed estates, by which an aristocracy will be supported at the expense of agriculture. The aristocracy of this country will be based on labor which produces raw material, conjoined with labor which shapes it into form for use.

The farmer and the manufacturer and the miner are therefore joined in fraternal interests, and are working together for the general good.

With the smoke of the factory in sight from his fields, the farmer finds a readier sale for all he produces, and the refuse of the town is the salvation of his land.

The farmer who annually sends tons of potash, phosphoric acid and ammonia off his lands, and never gives it anything in return, is just that surely living off of his capital and not his income. The development of the sugur industry will establish nuclei of manufactories in agricultural regions which, otherwise, would have to wait decades for them. From these centres other manufacturing industries will spring, until finally the farmer in Missouri will be quite independent of the artisan in Manchester and the coolie in Cuba.

Every thoughtful agriculturist will hail with delight that system of political economy which promises to increase the number and wealth of the non-agricultural classes, for thereby he will find his own prosperity established.

Hence it comes that in those States of our Union, where capital and population are most largely engaged in other pursuits, will be found the most prosperous agriculturists, although they may not be engaged in raising so called staple crops. The cotton growers of the South are now fully aware of the truth of this proposition, and the spindles are leaving the banks of the Merrimac and clustering along the hills of the Chattahooche.

Alabama, Tennessee and Georgia are already feeling the influence of new manufacturing interests, and these are showing their good work in the increasing value and productiveness of the soil.

In the United States at the present time 44 per cent. of the population are engaged in agriculture, 22 per cent. in manufacture and mining, and 10 per cent. in trade and transportation. But with its wealth of soils, its variety of climate, and its abundance of fertilizers, the country produces far greater supplies of agricultural products than are consumed at home or asked for abroad. The obvious results of over-production is a sluggishness in agricultural affairs.

The depression which follows an extraordinarily large crop is often as burdensome as the "hard times" that follow a poor one. The rational remedy for this difficulty is not to impoverish the land, or to seek to force our field products on an unwilling foreign trade. It is, on the contrary, to build up an increasing home trade by a system of economy which will put a larger per centage of our people in other pursuits, and thus relieve the plethora of agricultural competion. We should look forward to the time when not more than forty per cent. of our people are in the field, and then we may look for the golden age of farming.

The establishment of an indigenous sugar industry, capable of supplying the needs of the country, will, in my opinion, do more than any other one thing to secure this desirable result. With this purpose n view, the sugar grower in Louisiana, the sorghum grower of Missouri, and the beet grower of California can, at best, look with suspicion on all attempts to admit free of tax foreign sugars into this country, wether made by the cheap labor of Europe or the slave labor of the West Indies and the Sandwich Islands.

The results of free sugar trade with the latter country has been the founding of a vast monopoly which controls the trade of the Islands.

The price of sugar on the Pacific coast has not been reduced at all as a result of the arrangement.

The sugar industry of the United States is still in its infancy, and needs the fostering care and protection of the government.

MISSOURI.

The State of Missouri appears to be most favorably situated for the production of sugar from sorghum. The diversified soil and the warm summers of the State are favorable to the growth of the plant, and the long, mild autumns are peculiarly suitable to the process of manufacture.

The State lies almost wholly within the area of successful sorghum sugar culture, as outlined in my article in the "Prairie Farmer" of Chicago, for May 17th, 1884, and as indicated in the isothermal maps accompanying the special report of the Department of Agriculture, Chemical Bulletin No. 3. It is not to be expected that a new industry can spring, fully formed, into existence. It must grow. In Missouri, it appears to me the sorghum sugar industry will have a most favorable opportunity to grow. But farmers and capitalists should not rush blindly into the business. A wise foresight, accurate experiment, and above all, the careful training of men to do the work, all are all necessary to success. It is therefore best to begin in a *humble* way, but with a *proud* capital.

There should be abundant money back of the enterprise, and only enough invested for a few years to secure a healthy development without expecting a large return.

The army should be kept mainly in reserve, but a brisk fight should be kept up on the skirmish line.

The temerity which causes the ruin of one enterprise in the beginning of an industry, may put back its development for a whole decade.

But aside from sugar making, Missouri already possesses in sorghum syrup, an assured industry of no mean importance.

The manufacture of syrup can be successfully and profitably carried on in a small way, and at little expense. It thus becomes peculiarly a branch of manufacturing which the farmer himself can undertake and carry on.

It is hard to indicate the value of the syrup industry in a State like Missouri. Scattered over the entire State, the small mills and modest sheds of the sorghum factory, are numbered by the hundreds, and each contributes something to the general prosperity.

I close this brief study of the economics of sugar culture with a hope that the farmers of Missouri may find in it something worthy of their thought, and derive from it some help in their efforts to elevate and dignify American agriculture.

The following, by the secretary of this board, was delivered before the National Conventions of State Labor Statistical Bureaus, by request of its president, Hon. H. A. Newman, Commissioner for Missouri, and printed by his permission in this report.

LABOR AND STATISTICAL PROBLEMS OF THE FARM.

Accurate statistical facts are to become the measure of the development of individual industries, and of the world's progress. The children of the thinking few, industrial statistics are not appreciated by the masses whom they are intended to benefit. Thought fitted to please the fancy of the antiquarian and to fill the pages of the curious historian, they have already proven their utility as a measure of the value of methods, and as aids to producers and to commerce. They are positive industrial forces, teaching the time, direction and method of action. Accurate information gives not only a skillful, but a bold energetic policy. The products of agriculture are the supporters of life, and the parent of all the arts, hence agricultural statistics are the most important of all statistics. The interests of society are best served when the profits of the producers' labor are most nearly retained in the producers' hands. Yet, my experience is that farmers do not appreciate the value of statistics to them. Formerly, early private efforts informed speculators of crop prospects over broad areas, enabling them to buy in heavily, against a prospective poor crop. The profits of the harvest passed into a few hands, while the purchasing power of the great purchasing class was curtailed to the detriment of all trades. Under the influence of early and widespread statistical data, the wide and sudden fluctuation of prices has become less marked, and the profits at the farmers' expense, of speculators in produce, much diminished. The hour will not be, as it well might be, devoted to the discussion of the relation of agricultural statistical facts to farm development, and the develpment of the industries. I desire simply to assert their relative and absolute value. Nations no longer standing as isolated units, it is becoming more and more important that a system of prompt international interchange of statistical data be organized. The prices of our farm products are not now determined by the local conditions prevailing in the United States. Years of large crops brought us high prices, while at present foreign conditions are such that short crops bring us short prices, affecting the

prosperity of every interest of the country. Thus the 420,154,500 bushels of wheat of the crop of 1883 exported us wheat at a less price than the 444,602,725 bushels of 1882. I cannot trace out this subject here. Suffice it to say that our farmers, if needing for their protection and guide, statistics at all, need the statistics of the produce exporting and purchasing nations, and should at once witness a more decisive effort to procure them as promptly as commercial men do. They should be public property. A more effective system, an enforced system, should be inaugurated in our country. Township authorities should report to the county assessors, these latter to State officials, and the State officials to a national officer. These inquiries may be as broad as the value of the inquiry will warrant the expense.

The nominal functions of your honorable body, as gatherers of statistics relating to farm problems, as expressed in the law organizing State "Bureaus of Statistics of Labor," which says, "the Bureau shall collect statistical details relating to all departments of labor, especially in relation to the commercial, social, industrial, educational and sanitary condition of the laboring classes, and to the permanent prosperity of the productive industries of the State," naturally expands into a study of the causes that stimulate industrial activity and success. Your field is a broad one, and in its amplitude I propose to discuss the labor problems of the farm, and their relation to the social and material development of husbandry.

THE WAGE LABORER.

The industrial revolution of this country which has created new social and material systems, has assisted less the farm laborer than it has the wage laborer of any other important business. In its relation to labor the farm itself has suffered a positive loss. The causes are not so profound as to escape clear observation. Labor-saving machinery, with its division of labor into piece work, assisted by the iron horse, has necessitated great industrial centers. Here muscular effort has been supplanted by mechanical agencies; the hours of labor have become shortened and of a stated amount. Aggregated labor has the opportunities for the employment of the social instinct. Organizing its forces, it has learned its power and enjoys its discovered and not fruitless strength. The labor may have lost something of individualism in the city shops, yet, in the advantages named, its gregarious instinct feels ample compensation. Candor compels the acknowlegdment that the logic of events has forced, as well as led, a distinctive class of farm loborers from the country to the town. In the North, particularly in the manufacturing East, the farmer sighs for the faithful,

skillful farm laborer that has been attracted to the city by the library, schools and minor positions of trust. In the South, the social instinct of the negroes, coupled with a desire to educate their children, from motives not now material to analyze, has led them to as rapidly mass in the towns as the industrial development of towns would permit. While the development of the arts on the one hand has drawn labor to the towns, the evolution of farm mechanism on the other hand, compelled its departure from rural life with irresistable force. The plow has always been the emblem of agriculture, and its type the measure of the world's progress. In this century the bar-share plow, requiring three or four yoke of oxen to draw it, and three to four men to drive and to guide it for an acre of plowing per day, has been supplanted by the steel sulky plow, turning better three acres daily with but one man to drive and control it. Less labor is required in pulverizing the soil. The corn-planter does the work of ten men; the mower the work of four to five; the reaper the work of eight men, and during the war, in reaping, was estimated to have replaced 1,000,000 men in the harvest field. Without enumerating all the aids to farming, it may be said that every department of agriculture has seen labor economized and the work improved by machinery. The last census displays the true source of the Titan strides of agriculture, and of the arts, in the $68,940,486 worth of farm machinery as an annual product. A few of the important machines will illustrate the significance of the movement. There were made in 1880, 68,991 corn-planters; 19,288 cotton-planters; 8,153 fertilizer distributors; 43,222 grain drills; 20,289 grain-sowers; 446,059 cultivators and harrows; 1,326,123 plows; 25,737 harvesters; 35,327 reapers; 54,920 reapers and mowers combined; 72,090 mowers; 95,625 rakes; 2,951 hay-loaders; 33,453 potatoe-diggers; 44,370 corn-huskers. These, and scores of other machines, are covered by 35,960 patents in this country, making a movement unparalelled by any other age or by any other people of this age. At the beginning of this century this country exported but a very limited amount of the products of the farm, amounting to only a few millions. Now, our agricultural exports are three-fourths, or 77 per cent. of all exports, and amounted to $619,269,449 for 1883 for this country. This increase has been from $41,657,673 in 1820 to $48,055,184 in 1830; to $92,548,067 in 1840; to $108,605,713 in 1850; to $256,660,972 in 1860; to $361,188,483 in 1870; to $619,269,449 in 1880, as noted. The remark of Socrates "That agriculture is the mother and nurse of all the industries," is no mere sentiment for American application. At the opening of the century, it has been stated, that 80 per cent. of our population were engaged in agriculture.

This per centage has constantly decreased until the present moment. In 1860, 51 per cent. were farmers ; in 1870, 47.3 per cent., and in 1880 only 44 per cent. were thus occupied. Thus, while the proportion engaged in agriculture has steadily decreased, the exports have increased to a degree that challenges attention and admiration. Sir, agriculture has been no laggard ; indeed, it has measured the rapidity of the steps with which the arts have moved. Where do the industries get their surplus labor except through the labor that an improving agriculture discharges ? This great movement, resting in improved machinery and unnamed causes, has doubled the capacity of farm labor in the span of a life-time, and released nearly one-half of the labor applied to the farm. This diminution has been confined mainly to the wage laborer. The diminution of the farm population in New England, which has excited so much attention and apparent alarm for the future of rural life in that section, resulted not so much from the diminished profits of farming as from the release of labor and transfer of old industries diffused through rural sections to centers where machinery multiplied the results of labor. I have seen many a little shoemaker's shop of New Hampshire converted into a tool house, and the little room of the farm house devoted to shoemaking in winter and leisure times, closed forever to the sound of the hammer and the merry laugh of the stitcher, while the growing towns of Lynn and Haverill gained new workers. The vacancy created by this loss of ever-ready labor for seeding and harvesting was filled by machinery. The ring of the line of whetstones was replaced by the click of the mowing machine. Mechanism may perform the work of muscle, yet, headless and heartless, it affords no companionship. If we are to believe old farmers, the workmen of to-day are inferior to those of their youth ; and we may explain the change in part by ascribing to the isolation of the new order of events the turning from rural life the more active laborers. Militating stronger against securing the best labor on the farm is the uncertainty of its tenure and its hours of labor. The only certainty of hours of labor being surety of length. Asked to accept the hospitalities of a farmer past the middle age, after delivering an address in his town, I was treated to a disquisition on the worthlessness of present farm labor. John, the hired man of my host, was found at nearly sun-down at work in the strawberry patch ; at sunset he milked ; after dark, in the month of June, he ate, and then retired to his room to seek his only companionship in a squeaking fiddle. A paper, my friend said, he never read. Before light I was awakened by a call at the stairs for John to get up and milk. At the end of seven months John's time was completed, and he was left for the balance of the

year, covering the winter season, to obtain an occasional day's labor and to devote the balance of his time to saloon companionship. Such a system is demoralizing to labor. It begins and ends in hopelessness. Not all farm labor is so unfortunate; yet, in its average condition, it has at present discouragements. The employer and his family, also, suffer from this shifting system of farm labor whose interest in the farm and the character of its labor is bound by the most trivial ties. To the household it adds to the farmer's wife a most unwelcome increase of duty and a distasteful guest. To the children, it is often a moral pest, I have sought to show that the farmer and farm-laboror have suffered somewhat in certain directions from the wreck of the old polity. Have they failed to assimilate themselves to the new order, or has hard fate reserved these phases of farm life to perpetual misfortune? It is the belief of many thinkers that the growth of machinery and its possible expansion into the use of steam more fully on the farm, will gradually result in the centralization of land into fewer hands. To counteract this undesirable tendency and its consequent further isolation of the farm group, a co-operative system of farming is, by some, suggested, with land radiating from a village center. However much it may be desirable to philosophize upon the great problems that will arise in the development of the near future regarding landed interests. I seek to confine myself to the present visible mischiefs easy of eradication. Cottage homes on the farm, a little garden, a cow, a pig, newspapers, a few books and permant employment, with regular hours of labor, works a wondarful change in the desire of labor for farm work, and in the character of the labor retained on the farm. Continuous employement and a home on the farm attaches labor to the farm. Motives of self-interest, one of the strongest motives, creates and lends efficacy to zeal. The farm household is relieved of one of the most disagreeable features of woman's life on the farm. The lingering system of long days' labor in rural economy is entirely out of keeping with the privileges of the age. Nor, in my experience with labor, is anything gained in a long, dragging day's labor. In ten hours a man's normal capacity to labor may be exhausted. With a continuous experience in farming, with a balance sheet in view, upon three farms, and with three distinct classes of labor, I have no hesitation in saying that the best day labor of the age can be retained on the farm under the conditions named, and that a system of farming adapted to tne continuous employment of labor not only can be inaugurated, but is found to be the most profitable system. Tne landed property of the country is deeply interested in securing good, reliable labor against the seductive influence of the town, and does not wish

thrown back upon it the vicious, disipated or nerveless labor that the town will not trust its interests with. By attaching labor to the farm by permanent employment and comfortable homes the farm laborer becomes conservative. He is never a striker; communism finds no lodgment with him and property no enemy in his person. Indeed, he becomes, through interest and settled habits of labor, a more positive source of wealth and strength to the community. Of the influence of education upon farm labor, little need be said distinct from the acknowledged influence of education upon labor in general. The diversity of farm operations require more tact, and the executive faculty better developed in the farm laborer than in the laborer of any other industry. If I may be allowed to add personal experience to the mass of facts in tribute to educated labor, I must most emphatically endorse the laborer with his weekly family paper. He has clearer views of the just relations of capital and labor, and not only is less captious but is a more perceptive and adept workman. Grouping the farmer and farm labor into one class, we find that the educated labor of the North is much more productive than that of the South on the farm. But abnormal causes affect the problem. If we set the United States against Europe, we find that, as a whole, this country has a much less proportion of its population engaged in agriculture than in Europe, but a far greater proportion that can read and write. According to Mulhall, Europe produces 16.50 bushsel of grain per capita and the United States 48.10 per capita. Europe produces 51.1 pounds meat per capita and this country 171.0 pounds. The United States sells heavilyand Europe buys food. Europe produces 1506 bushels grain per acre and the Unted States 23.3 bushels. Portugal, in 1860, had but 1 in 36 at schools and grew but 11.64 bushels grain per acre. Spain, in round numbers, has but 25 per cent. of her population that can read and write, and gains 12.20 bushels per acre. France, in 1860, had 58.28 per cent. over six years of age that read and wrote, and obtained 18.50 bushels per acre. In Germany the great bulk of the population read and write, and her farmers grow 22.05bushels per acre of grain. It is true that other and apparently disturbing causes modify the value of the above application. A review of statistical data for Europe and America will show that the products per acre are in direct ratio to the products of manufactories and the earnings of commerce. The diffusion of knowledge is the grand moving impulse that has developed arts and commerce, and that has created the culture and wealth to enjoy their fruits and to further stimulate them by its patronage. Educated labor on the American farm has been the cause of this abundance of rural products. In educated countries it has not failed to reap, in common with other labor, the benefits of its own

energy. The advance in wages of farm labor has kept step with that of other labor, and calls for no distinctive statistical mention here. It is worthy of mention, here, that farm labor is the best paid where thrift has introduced the arts the fullest. Massachusetts pays the highest rate, save new sections, as she is first in manufactures. Grouping the country by sections, our National Department of Agriculture finds that the manufacturing Eastern States pay $26.61 per month by the year, and the Southern States $15.30. Ohio $24.55; Kentucky, by its side, $18.20 and Massachusetts $30.66 per month. Dividing Ohio into sections, it is found by the same authority that the greater the non-agricultural population, the higher the rate of wages, varying from $25.96 per moth to $22.65. Vermont, manufacturing the least of any New England State, pays the least of this group of States for wages on the farm. Vermont has $28.8 invested per capita of her population in manufactures, and pays $23.7 per month for farm labor. Massachusetts has invested in manufactures per capita $74.4 and pays $30.66 for farm labor per month. It would be interesting and profitable to compare the earnnings of farm labor with that of other labor. It involves the search for and critical analyses of facts that time at command will not allow. Excluding the drifting wage laborers of the rural sections alluded to, it may be safely affirmed that the net products of steadily-employed farm labor is fully equal to that secured by the unskilled labor of cities. The Department of Agriculture estimates, from figures of Carry in 1836, that labor on the farm in 1866 had increased seventy-two per cent. in value. Sir James Caird, in "His Landed Interests," estimates the rise since the repeal of the corn laws at sixty per cent. for England, according to a writer in the Popular Science Monthly for May. With this rise, despite the exceptions, a decrease of the hours of labor has occurred. The American farm laborer has his meat twice a day; his tea, coffee, sugar, tobacco, often his carpet, paper, occasionally an organ, and in a few foolish instances his horse, and is never forced to keep his children from school as wage earners. His fortunate comparison with European rural labor in all these respects, the causes, and the causes of the superiority of his labor over European farm labor, I must leave for the socialogist and statesman to study. For my part, I am anxious to see his continuous advance. If distaste for manual labor grows in the future as in the past, and the men fitted to fill any station increase as in recent ratios, unskilled labor will receive wages constantly approximating to those of skilled labor and clerical work, and will afford a partial solution of the volcanic labor problems of the times. Indeed, the farm laborer of to-day receives as much for his labor as the proprietor. In answer to circulars sent to 456

farmers of this State, distributed in every county, I received answer that, after deducting the farmer's time at $1 per day, 8⅓ per cent. would be realized on the farm for the capital invested. As the legal rate of interest in this State is 8 per cent., the farmer receives, substantially, no returns for his care and skill. It has been carefully estimated that the lands of this country pay but 3 per cent interest and ordinary wages for labor applied.

PROPRIETARY LABOR.

While a broad distinction exists between wage labor and proprietary labor, yet in this country the latter is a laborer in the physical sense of the word. Our system of farm ownership is unique. Here the proprietor is actually the tiller of the soil. The fact that, after deducting the interest of his investment, only wage labor rates are realized by him, displays our farmer as a proprietary laborer. The census of 1880 emphasises this fact. It shows 3,323,846 farm laborers, and 4,346,617 engaged in agriculture, most of whom are actual owners. In this fact we have an emphatic explanation of the success of American farming over that of European, as already noted statistically. The highest results in any art can come only from the quickened perceptions and energy that ownership gives. Individual interest in land is the parent of all broad, permanent farm improvements. The decay of Roman agriculture began when the presence of the owner was exchanged for that of the bailiff—when the small proprietor disappeared to reappear as the Coloni, and slave labor swarmed on the great estates of the Patricians, demoralizing all free labor coming in contact with it. The spiritless farming of Spain, Italy and Austria, and in fact most of Europe, rests in the entailed mischiefs of Fendalism, whose system is not completely wrecked, and whose influence still lives on. England, it is true, with tenant farming grows much more per acre than do we. But this is the outcome of high priced land, boundless markets, and long leases; yet, when we consider the grain raised her farm laborer, the United States leads, as it does in the character of its tools and in the energy of their use. In this country the two systems of land labor existed: the small proprietor working his own farm, and the plantation with employed or enforced labor. I will select two states adjoining and typical of the two types, Ohio and Virginia. In 1860 the average size of the farms of Ohio was 114 acres; in Virginia the average was 324 acres. In some of the southerm states the farms were twice as large, but these two adjoin and afford a better comparison, although the difference is more marked in other states. The crops of 1882 were as follows: Ohio, wheat per acre, 15.1 bushels; Virginia, 9;

corn, Ohio 31.3, Virginia 19,1; rye, Ohio 12.4, Virginia 6.7; oats, Ohio 26.4, Virginia 16.2; barley, 16.8 for Ohio and Virginia 16.2 bushels. Since the war, the plantation has passed into history with its memories, and the owner of the soil is becoming its tiller. A quiet revolution is taking place in its agriculture, the importance of which has partially escaped attention. The size of the farms have been amazingly reduced in the brief space of 15 years, from the close of strife to 1880. They have been reorganized as follows: In Virginia, from 324 to 167; in South Carolina from 458 to 143; in Louisiana from 536 to 172, and in Mississippi from 370 to 156 acres. What is the effect of this collosal movement? A new agricultural South; yes a new industrial South, whose prosperity every good American rejoices in. Taking a group of southern states we find that an actual increase of wheat is being realized, while the trans Mississippi states are still on the decline. Virginia, North Carolina, South Carolina and Georgia average 7.3 bushels of wheat only, from 1868 to 1875. From 1875 to 1882 the average was 7.7 bushels or a gain of 5 per cent in 7 years. The tendency of our people to attach themselves to land, despite the cry that young men all rush to the cities, is evinced in the continous decline in the size of farms. The average size of farms in 1850 was 205 acres; in 1860, 199 acres; in 1870, 153, and 1880 farms were only 134 acres in average. The movement is one to interest statesmen. Land ownership by the masses means the growth of a conservative element in all that affects stability of civil society, and in the future it will be found that the stability of our government will rest more upon this fact than upon any other single element. A landless people is more dangerous than an ignorant one. The prediction has been indulged in that the irresistable tendency of machinery was to centralization on the farm, or to larger farms. Events, as seen, have not justified the prophecy. The well know mammoth farms of Dalrymple and Dr. Glenn have failed of success as others have. When the first fertility is exhausted and recuperative farming becomes necessary insurmountable obstacles have presented themselves in rotations, manuring and the economical handling of help in mass that has no definite interest in the farm. Our people are now displaying a sensitiveness over the great holdings gained by purchase on the plains. Until new developments destroy the force of present tendencies not the slightest fear need be harbored of those great estates. The rise in the price of land puts nomadic farming at a disadvantage. The result does not warrant the interest money involved, and better methods enforce, in the absence of the law of primogenture, disintergration. Ownership then is the first requisite to successful application of labor to the farm.

MEDIUM SIZED FARMS

may be mentioned as a second favoring condition to the economy of labor in husbandry. There has always been a strong sentiment favoring small farms. Statesmen, observing that eqality of condition and ownership among the masses tended to stability of government, have been pronounced advocates of so-called "Intensive farming." Laveleye in his "Primitive Property" says: "Modern democracies will only escape the destiny of ancient democracies by adopting laws such as shall secure the distribution of property among a large number of holders and shall establish a very general equality of conditions. In persuance of this belief, efforts of writers and legislative reformers have been directed towards the distribution of land among the masses. Students of Grecian and Roman histories will recall the emphatic forms the movement took in these countries, while the memories of the French revolution belong to only the last generation with its establisment of small holdings. The ground swell of the coming, or even of present agitation in Britain is plainly visible, that will overthrow by peaceful revolution, its present system of landlordism. In France there are 5,550,000 properties of which 500,000 only average 60 acres, while 5,000,000 are under 6 acres. In England and Wales not one in twenty own property in land; only 269,547 own over an acre of land, and 7,000 landlords own two-thirds of all England. These are the two extremes in the case of two great and civilized nations. Under which is labor most effective? Under the English system. The cause is explicable in part in the education, commerce and in the manufacturing centres of England, as stimuli; also in the further fact the English estates are leased out in moderate sized farms on long leases. These do not explain the entire causes why England raises 28 bushels of wheat per acre to France's 15, and England 36.6 bushels of grain to France's 18.5. France, with her petite farming, raises less than Germany with larger estates and less of home markets or encouragements through manufacturers. Germany produces 22 bushels of all grains, per acre. The cheap lands of America exceed both, being 23.3 bushels. The six acre farmers of France are forced to live in the past. The spade and manual labor do the duty of the plow and the horse. It is the system of brute force It paralyses rather than whets energy. It creates indolence rather than thrift. What is the six acre wheat, corn and potato grower to do with his surplus labor for one half the year? Tied to a narrow circle his time one-half fallow and the other half expended in brute force, the French peasant lives in mental stagnation, is denied meat, and wears

wooden shoes. Britain eats 119 pounds of meat per capita, and France 81 pounds, Britain using 47 per cent. more than France. We speak of French wealth. She has 51 per cent. of her population engaged in farming and buys food. The United States has 44 per cent. of her population, only, as farmers, tills farms of 134 acres, uses machinery, and sells the most food of any people in the world. French wealth is the stocking hoardings of these little farmers who have starved mind and body and denied the back. Let us not mistake that which constitute the true wealth and happiness of a people. It is easy to pay too dear a price for savings. The capacity to earn or produce represents the genius of a people. Our people have not misunderstood the demands of the age, and are not ignorant of the fact that the growth of civilization rests heavily upon the dominance of mind over matter, and hence are using animal and natural forces to execute their purposes. In 1870 there were in this country 1,321,117 farms, under fifty acres. In 1880 there were but 1,185,414 such farms; a decrease of 145,703 farms under fifty acres in ten years. Can we comprehend the rapidity and significance of this great movement in the space of ten years? Machinery must have fair play or it is valueless. The march of its development has remorselessly driven the small farmer from the field, and revealed in our holdings, and farms recently fitted for machinery, worked by the soil owners, the supposed great rural nation of the world. A false supposition, as but England, Belgium and Holland contain so small a proportion of farmers, while Europe contains a very much larger proportion. It is the genius of our people, of machinery, ownership of soil by the tiller and education that are seen in these results. I have before noticed that the average size of farms is decreasing. It seems that neither large nor small farms are desirable for the best results, as competition, untrammelled by the fossilised notions of Europe clearly reveals. Such is my experience as a farmer. 150 acres of ground is enough to afford good machinery and not too unwieldy for "intensive" methods. With questions that sociologists may raise, I have nothing to do. If the world desires man to work by methods through which the most is accomplished with the least expenditure of human energy, then at present, the way is clear as to the size of the farm. What co-operation may yet do is for the future to answer. The past has left but the ashes of hope.

THIRDLY—CAPITAL WITH LABOR.

It is not my purpose to detain you by giving the statistical proof of the superior results of farming where capital and labor are wedded on

the farm. The world famous farmer, Alderman Mechi of England, used to assert that $100 per acre of land used in personal capital was essential to successful English farming. Capital is the right arm of labor in agriculture as elsewhere. "Intensive farming," as understood, narrows efforts and divorces machinery. "Extensive farming" is broad acres, with little capital and poor tillage. Capital and skilled labor combine the two, and give "intensive" "extensive farming." In England it means forty to fifty bushels of wheat to the acre with good farmers, and other crops in correspondence to this. Extensive farming in this country means an average of ten to twelve bushels of wheat per acre.

The United States has 288,771,042 acres of improved land and $1,906,984,675 personal capital invested in them, or $6.60 worth of capital, only, per acre in stock and tools. Adding the value of crops and other necessary personal property, and the capital invested is so small that we behold, clearly, a pioneer type of farming, based upon men, tools and soil robbery. The system hardly touches the capacity of the man or the farm. The only genius in it is that of mechanism. The value of crops per acre of farm land for the whole country averages but $6.77. Capital, machinery, skill, rotation of crops, stock and manures can easily multiply this yield six fold at present rates, on a farm suitably divided into woods, fields and pasturage land. A well known English farm, managed at a profit, sells of staple crops, wheat, clover, barley, oats, whose prices this body know are not greatly above those of Chicago, $20,000 to $25,000 worth annually from 450 acres. I give this as a pleasing promise of the possibilities of the future. My own estimate is that of sober experience. I will not now, for want of opportunity on my own part rather than from sympathy with my suffering hearers, give the relation of capital in Europe and America to farm results. My purpose is to bemoan, uselessly, I suppose, the effects on American Agriculture of non-capitalized farming. It has sped the plow faster than the furnace, the anvil and the loom, the producer than the consumer. The bounty of ages to our soil has gone to fatten the soil of Europe at a price per bushel of grain, at the farm, that our sons will again pay for fertilizers to grow other bushels with. The wave of depletion began at the Atlantic coast and has already swept to the Pacific; impartial in its operation it has spared no section. A few brief facts will be noted. Prof. Collier has shown that by dividing the country into two sections, East and West, and into two periods of nine years each, that the decline in corn per acre from the first period would amount to $30,000,000 annual sales in the West, while recuperative farming now set in the East would increase the value yearly $1,250,000.

California started out, by the first report of the Department of Agriculture in 1862, bravely, with a yield of 24½ bushels of wheat to the acre. This inexhaustible State that was to feed the world, now grows in shame an average of thirteen bushels to the acre. Our own State of Missouri has gone down in successive periods of five years from 14 to 12.4 and 11.7 bushels of wheat per acre. In corn a decrease of a bushel every five years. The East is now capitalizing its farming, and her sons are now paying for the follies of their fathers in buying fertilizers to recuperate the soil at a dear price. A table from Prof. Schweitzer shows the movement. By this, nineteen years from 1862 are divided into four periods.

STATES.

Period.....	Kansas.....	Missouri.....	Iowa.....	Nebraska.....	Minnesota.....	Maine.....	New Hampshire	Vermont.....	Massachusetts...
1	17.2	15.1	13.7	16.0	17.0	12.9	14.2	15.1	16.5
2	16.9	14.0	13.7	17.7	14.7	12 7	14.5	14.5	17.1
3	14.4	13 2	11.9	12.4	15.2	13.8	15.9	16.6	17.2
4	13.1	13.1	11.1	12.7	14.3	13.7	14 5	16 4	16.5

These few States are quoted as representatives of the tendency of two groups of States, to wit: the food selling and the food purchasing States. The latter are manufacturing States, and have but 28.1 per cent. of their population engaged in agriculture, while the former have 56.5 per cent thus occupied. What are the former States losing by their "extensive" non-capitalized system of farming? I may here explain my meaning by non-capitalized system. A system in which the hands and machinery are the main factors. With no buildings, dairies and little stock, and the grain crops, which are grown as successive crops, the raw products of the farm, are at once sold from the farm. This is the very simplicity of farming. Kansas in fifteen years has seen her average of wheat reduced 4.1 bushels per acre. As Kansas grew 1,534,350 acres of wheat last year this loss reaches 6,280,835 bushels, which, at 70 cents, amounts to $4,396,584.50 yearly for one State. To every farmer growing 100 acres of wheat it amounts to the sum of $287. This exhausting process has gone so far that labor is barely remunerated. The average of this State, Missouri, for the past five years of 11.1 bushels of wheat

per acre will not pay more than wage rates, in fact not that when the non productive days are estimated. But what else is lost by Kansas in her wheat sales? If she sells 15,000,000 bushels yearly she sells 18,920,000 pounds of nitrogen, 7,100,000 pounds of phosphoric acid and 4,620,000 of potash, soil ingredients of crops, most of which a more rational system of farming might retain to the soil. The farmers of the States that once pursued this policy are now paying for these materials in the form of artificial fertilizers $25,000,000 to $30,000,000 annually. At the market rate thus established, Kansas sells in her wheat that which her sons will yet buy, materials that are worth $4,820,800 annually. This for wheat alone. The drain in corn and wheat from the United States to Europe annually is appalling. I am accustomed to view the tables massed by others, of our exports, as the pride and wealth of our country. Our capacity for future exportation is fondly enlarged upon. For my part I can but regard the shame of a nation as proportioned to her sale of raw products, and look with eagerness for the period when we shall cease entirely to build up the centres of industry and fatten the soil of foreign peoples at the expense of ours. It would have been better for us if our industries had diversified faster and our lands been overrun less rapidly. In the nature of events it was not to be. The future we can in a measure control. In this connection the relation of the arts to farm values, price of lands, produce and labor, would be interesting to review. Hon. J. R. Dodge, in the last report of the Department of Agriculture, has with much ability arrayed most valuable statistical facts. I will arrange from Mulhall a short table of European facts, showing the relation of commerce and manufactures to the produce of grain per acre.

	Earnings of Commerce and manufactures in shillings per head.	Bushels grain per acre.
Great Brittain	838	36.40
Holland	780	28.80
United States	475	28.08
Belgium	684	32.72
France	439	18.50
Austria	177	15.04
Spain	153	12.20
Italy	151	13.80
Portugal	110	11.64
Germany	359	20.05
Russia	109	10.25
Europe	290	15.06

With one or two exceptions the products per acre follow the earnings of commerce and manufactures. In the case of Belgium against Holland it is found that Belgium's earning from manufactures are 310 to 210 for Holland. Manufactures are more valuable in developing industrial centres than commerce. German agriculture excels French plat-work farming. Germany is the home of schools of agriculture and of the first experiment station.

INDUSTRIAL EDUCATION

May be named as the fourth aid to agricultural labor. Why teach agriculture? For the same reason that we teach law, medicine, civil engineering, or any other art or profession: because there is that to be learned that is of industrial value that experience will never acquire, and much that when acquired by experience is gained at too great an expense. Zenophen hinted at, and Columella clearly enunciated in the language of to-day, the necessity of technical education for the farmer. It remained for Von Thaer to establish in Prussia at the very beginning of the century the first agricultural college. The history of the progress of agricultural education need not be traced. While narrow prejudice, or ignorance of the complex laws upon which husbandry is founded, debates, agricultural education expands.

Europe is stated to have 1,200 schools of agriculture. France teaches it, by recent enactment, in her common schools. The United States has a college for every State, and Tennessee puts a text book of agriculture into her common schools. While all admit that the farmer is in contact with the laws upon which the natural sciences, chemistry, geology, physiology, anatomy, physics, mineralogy, botany, entomology, are founded, still they inquire, "What has agricultural colleges got to teach, and of what industrial value is it?" I will briefly review this compound question in two sections.

Agriculture, the greatest and the oldest of industries, has continued for all time without experimental facts to guide its labor. This astounding fact is not so inexplicable as the present doubt of the value of imparted facts. No important question of to-day in farming has a general agreement of views, and under the conditions practices vary, being conducted upon opposing principles. From tens of important questions, I note the timely one of deep and shallow tillage of corn. Which?—both are practiced. Important physical laws are involved and the size of the crop modified by the method pursued. I found last year that the amount of water in the soil was varied 100,000 pounds or more per acre by the method of tilling it, and the crop increased twenty bushels. But even one per cent. change for Missouri means 1,616,550 bushels of corn. Agricultural colleges should teach farm labor the principles, and the facts upon which principles and practices are founded, and divorce the industry from the empiricism, the rule of thumb process, that each farmer in succession must learn by a life-time of costly mistakes, and at the expense of the world's progress.

Are there facts and principles to be taught? It would require volumes to recount the achievements of this century in agricultural research. It had the aid of the brightest genius of the age. Sir Humphrey Davy, Liebig for a life time, Darwin, Pasteur, Voelker, Laws, Gilbert, Wolff, Boussingault, Voit and innumerable others. Laws has devoted $15,000 a year, of private funds, and has been systematically investigating questions in animal and plant physiology and chemistry for forty-five years, employing ten to fifteen workers. Boussingault has been at work for a like period on his farm. The first public experiment station was organized in Saxony in 1852 for the sole purpose of acquiring farm facts by the systematic investigations of experts. To-day the world has about 150 public and private experiment stations whose sole duty is to study farm problems and facts. Adding to their work the volunteer efforts that this free movement engenders, and the experimental inquiry of many of those connected

with agricultural colleges, and a corps of investigators form a movement without a parallel in the world's history, and which casts a shadow on all investigations in extent and value of the facts and literature being acquired. The facts are enabling us to formulate laws. Secondly, we may inquire as to the utility of these laws. It would seem to be enough to demonstrate the utility of facts to affirm the truism that "Other things being equal" that he who works in consonance with law works to the best advantage. The advantages are, first, its effects on the man: it broadens and ennobles him. For the first time in history it has principles well defined for systematic study. Bacon measured it well when he burned his farm library because it "contained no principle, and therefore was of use to no man," as he said. To-day no profession requires so wide a range of observation and so broad a study of the natural sciences as farming for its mastery, although none can be prosecuted with so little information in an imperfect way. Virgil opens up to our view the possible effect of agriculture on man's development. He says, "The Sire himself willed the ways of tillage not to be easy, and first roused the field by art whetting the skill of mortals with care." In its perfection, the first born industry and the last that will survive it is calculated best to develop the intellectual man. The field is just being entered upon, of science applied to agriculture. Secondly, farm facts are farm forces. Positive knowledge emboldens policy, swung loose from uncertainty, a generous and vigorous policy will result. Thirdly, history and prophecy clearly tell and foretell of the enormous influence of science, law, organized facts, upon economic agriculture. In a recent bulletin, I presented experimental data showing that $5,000,000 or more could be saved on the swine fed in Missouri annually if known facts were applied. I have no doubt that if every fact observed by recent study in animal and plant nutrition was the common property of every Missourian, that her annual food would be doubled in value received from them. That it can be far more than doubled, years of special experimental feeding trials justifies me in affirming. Illinois is reported to have lost in a single year by insects $18,000,000. Paris green, pyretherum, and emulsions of kerosene oil, the gifts of science, are saving the country annually tens of millions. Descending to little things, I observe that few double-trees are made so as to distribute the work evenly for a pair of horses, but are made to the injury of the free horse. Every team hitched up, and their numbers are legion, with line of draft out of right line involves a positive loss of force, and even of material. Every plow adapted to clay land used on sandy land entails a double loss. Cutting short that which might extend

into lectures, it is enough to say to those who rely upon books and papers for instruction, that if it is of advantage for a doctor, lawyer or engineer to study under masters of their profession, facts systematically organized, that they may start in life and at the first blow with the experience of the ages well digested, and with the principles upon which action is based and given effects determined, then it is important that the young farmer becomes familiar with the failures and successes, with the experimental facts of the world.

It is a fortunate phaze of this greatest of industrial educational questions that the technical education of the largest class of citizens covers all the natural sciences, and is well fitted to adorn as well as to instruct the mind, and the contact of the individual with living forms invites to thoughtfulness.

The importance of the farmers' education to every citizen, as all citizens are food consumers, is ample justification of the aid nominally extended to the farmer, but really to the State itself; as the State and every art, and even life itself, rests upon agriculture. The better the agriculture, the cheaper the food of all; the shorter the day's labor, the more workers to prosecute the arts and to extend civilization, without which life is not worth living. The great interests of civilization cannot allow the "foundation industry" that sets the price of bread, and whose products are, in the language of Gibbon, "The materials of art," to remain in ignorance of the economic principles that underly it. This interest holds more wealth than all others combined. In the United States its farms and machinery are valued at $10,603,616,751, and its annual productions at $2,213,402,564. No one familiar with the defects of farm methods and their causes, can for a moment doubt that profound results will flow from the study of the first principles of agriculture in rural or common schools. The taste for further information there acquired would carry many students to central schools, where the experiment station to acquire original facts should exist by the side of the institution for imparting to youths the facts of the world. Under a perfected system of elementary instruction in agriculture the products of the energy and land involved in our present great productions, as noted, would be vastly expanded. Our present agricultural colleges have disappointed many of their friends. I need not dwell upon their defects. All are young, and their fruits in the future. Many of them are only agricultural in name, while some in the hands of a snobbish scholasticism, became ashamed of the name and changed it to University of ————. Yet they are unmistakably perfecting their systems of instructions, and their instructions are but the beginning of a movement bound to result in a revolution in the social po-

sition of the farmer, and in a radical change of farm polity, and in the results of that polity.

BEARINGS OF STATISTICS UPON OUR FUTURE DEVELOPMENT.

In 1860, we raised 46.0 bushels of the cereals per capita; 1870, 50.8; 1880, 53.7 bushels per capita. Ten years ago we exported $492,760,867 of agricultural products; last year, $619,269,632. Fifty years ago our exports were in round numbers only $4,000,000 annually. This ratio of growth has been projected into the future by pleasing mathematicians to the wealth and glory of our country. I neither wish for nor believe that exportation of our farm products are to increase. The expansion in exportation came with the impulse that cheapened transportation, and the development of machinery gave to the soil robber overspreading our free prairies, by the aids named, the access of these distant lands, for the first time, to foreign markets. Several reasons shut us off from expectation of the continuance of this increase: First, the causes that developed our exportation is now operating in new fields—in South America, Australia, New Zeland and India, and is developing untouched sections of Russia. Our lands are now earning, under important rates of interest, and our people cannot and ought not to live as cheaply as some of our competitors do. Indian competion, from which we have less to fear than from other competitors, has increased her exports within two years from practically nothing to 34,059,940 bushels, and illustrates the rapidity with which commercial changes are now developed. This movement affects not only grain but live stock and meats. The exportation of carcasses from New Zeland since 1880 has increased from 400 to 193,645 at present. Secondly, to-day our good cheap lands are all in the hands of corporations or private citizens. We have no more kingdoms to overrun. Beyond the 100th meridian the rain fall varies from three to twenty inches annually to the base of the mountains. Irrigation is proposed, but not enough rain falls east of the mountains to irrigate only limited areas, where water is available at all. Even west of the mountains the rain fall is so limited as to restrict agriculture. One-third of our country, or all west of the 100th meridian, will not be long self-supporting. This meridian cuts off one-third of Kansas, nearly one-half of Texas and Nebraska, and one-half of Dakota. That this view of our agricultural lands is no chimera, the actual decrease of seventeen counties of western Kansas in population last year is ample proof. At my office I am frequently in receipt of letters from this section regarding Missouri lands, coupled with a statement that they, the writers, are too far west. Texas, settled by enterprising men iu the last fifteen years, grew last

year 8.5 bushels of wheat per acre, and of corn, 17.5 bushels. We scarcely need the assertion of cattle men, that the great bulk of the State is only fitted for grazing, and requires twenty acres per steer. Emphasizing this belief that the best land is all in view, I offer government statistics, which show that the number of farms from 1870 to 1880 increaseed 50.7 per cent., while the increase of acres in farms was but 31.5, showing the process of condensation in settling up the land overspread is going rapidly forward. The further fact heretofore shown that small farms are decreasing, while the number of farms have actually increased faster than the acres occupied through diminution of size, shows that a tendency to work the territory occupied in preference to obtaining new lands, is stronger than the face of the facts declare.

In 1860, we grew of all animals, 2.9 per capita; in 1880, 2.7; and in 1884, 2.5 per capita of population. The increase in weight has probably given us a little, and only a little, faster development of meat than population, although the numbers have not kept pace with the "babies," as some one has quaintly put it. We do not grow our own wool in full; we are $100,000 worth of sugar short in production; we are about one-half as much short in fibres; we have a line of tropical fruits and other products to grow, and 35,000,000 more mouths to feed within the space intervening between this and 1900. This new population will settle to a larger extent than ever in centers of industry, as cheap and desirable land will tempt less. How much land is there to spare in the area of good lands east of the 100th meridian? From 1870 to 1880, the acres of land in farms increased 128,346,794, or 12,834,679 yearly. Of this increase, only 1,016,957 annually occurred west of the 100th meridian, save that which may have occurred west of this point in the States cut by this line, which, if estimated in a liberal spirit at another million, leaves the great increase east of this line, or nearly 10,000,000 annually, or 84 per cent. of the total increase. It is a significant fact that New Mexico decreased her area in farms about 25 per cent. What, then, is the opportunity of increase east of this 100th meridian? The following figures I have made up mostly from the census of 1880, since which time it must be clearly borne in mind that the best of remaining land has been with unusual rapidity absorbed: Total land, including rivers, lakes ponds, wastes, mountains, etc., east of the above line, 968,391,039 acres. In farms, 494,475,095. Acres in farms improved, 256,334,955. West of above meridian only 28,436,037 acres of improved land are found. We find, then, 473,915,044 acres of land east of the 100th meridian not in farms, or neafly one-half of the total area. Where is this land, and what of it? The thirteen original States

and Vermont are all of them but four, northern States, and manufacturing States, well populated and old. Land in total in these States, 210,539,520 acres; unimproved land, 136,955,946 acres; not inclosed in farms, 71, 489,236 acres, one-third of it is not yet regarded as farm land, and only 34.9 per cent. is improved land. When a country has been overrun, as these fourteen States, by population, have been, we may rest assured that the land rejected will not come into use until a new order of events occur. If the settlement of the land of these States represents the probable settlement of the lands of the section in review under the present order of development, we shall have only 337,968,472 acres for improved farming, of which 256,334,954 acres were in use in 1880. This would be absorbed at the previous rate of settlement in seven years. But all States are not like these fourteen, and we strike out from our total area those 136,955,646 acres of unimproved land of these fourteen States as of little moment as food producers at present. The next group we strike is Michigan, Wisconsin and Minnesota. Here we find a total of 124,099,840 acres, 42,553,357 in farms and 24,506,084 acres improved, leaving a round 100,000,000, or 80 odd per cent. unimproved, while these middle-aged States are sending swarms of emigrants from their borders for desirable lands. And notwitstanding the growth of villages, several counties have made little or no growth in each State, and their increase of improved land for the date, in ten years, slow. These cold wooded States of the north will come freely into use only on a new demand. Ohio, Indiana and Illinois are the best occupied States in the Union, having 76,623,854 acres out of 82,677,120 total acres in farms. Their good farms sell for from $75 to $100 an acre. It is idle to look for valuable land unoccupied here to expand our commerce. Iowa, in 1880, had 24,752,700 acres in farms out of 35,228,800 acres. This proportion is large, considering waste land, water, cities, etc.

Western Kansas is already depopulating, as seen. It is in seven of the Southern States that the great reserve of land is found. Texas, east of the 100th meridian, Arkansas, Mississippi, Louisiana, Alabama, Florida and Georgia contain 250,471,021 acres, of which but 94,416,465 acres are in farms, and only 35,080,580 acres are improved. Are these sections going to swell our commerce in farm products? They will make cotton and may make the 200,000,000 in sugar this country will soon want, but at present they are far from feeding themselves. A look at facts creates doubts as to a growth more than commensurate with the expansion of our own demands. The wheat last year varied in these States from 5.1 to 8.5 bushels per acre. Will $1 labor, six bushels of wheat per acre on impoverished land, most of which is none too good,

and in a climate unfavorable to wheat and energy, seize the markets of Europe against cheaper labor and more favoring climes? They would import wheat to-day if the west did not supply them. Corn figures as low as eight bushels per acre, and runs as high as 17.5 bushels. One-half of this southern area is Texas and Florida lands. Large sections of the other States are very poor, and much at present worthless. Cattle, as well as wheat, suffer either by climate or ignorance in the south. Key West, Florida, shipped, in 1882, 27,292 cattle at $15.05 a head. The stock were of Spanish origin. New York shipped 33,412 head at $99.77 each. These differences will require time to bridge. I would not disparage our natural resources. Theoretically, I am among the first to recognize the fact that they are practically untouched. The land we are using is but returning the products of child efforts. Yet practically, with the utmost confidence, I assert my belief that we shall not long desire wider markets abroad, that we shall soon need less and less markets abroad, and that the young men of the present will yet see home markets pressing our producers into better methods. At the present rate of increase we shall number 4,000,000,000 of population in less than a century. We very likely may not number 200,000,000 at that period. We may rest assured that we shall open the next century, which is close at hand, with population growing faster than produce to feed it. I cannot too strongly emphasize the fact that our best ground has been spread over east of the 100th meridian, but especially that the land rejected by the first settlers will come slowly into use and only on a clear demand, which will arise only under new commercial conditions. The history of every old State is evidence of it. May I ask, why shall we longer show such tumultuous eagerness to center here a babel of languages to divide our circumscribing loaf and to dilute the homogeneity of our people.

In conclusion, I predict that in 1900 we shall export less and import less per capita, growing centers producing more of our needs from the arts, and consuming more of farm products. I confidently expect to see American agriculture take on more of the methods of a settled country, becoming more intensive and less extensive in its characteristics. In short, the half nomad type of farmer has nearly had his day and about completed his work; henceforth, we are to see more of the genius of farming in this favored country. "The gleam of the American coulter" in the fat soil it cuts shall reflect in the future typical lord of the soil, qualities of mind, like the coulter and soil, polished and fertile.

THE BOOK AND THE PLOW.

By Professor D. R. McAnally.

A late number of a popular magazine contained a clever sketch of a family scene. The room was plainly but comfortably furnished; there were curtains at the window and a carpet on the floor, the farmer was on one side of a table reading a book, his wife on the other looking over a fashion paper, a sewing machine stood in the corner, pictures hung on the walls, the daughter was practicing on a piano and a cheerful glow was cast over the whole by the light of a coal oil lamp. The sketch caused the reflection that in no previous age of the world was such a scene possible. Even so lately as one hundred years ago such a picture of home life could not have been presented, for the simple reason that man now has what money then could not buy, for the things were not in existence. The labor of inventors has supplied our wants in this age to so considerable an extent that we wonder how our ancestors could have endured life with what seem to us so few comforts, or even conveniences. All a king's money a century ago could not have bought one chromo, because there were then no chromos. Our books, our carpets, our clothing, our household conveniences and our labor-saving machinery are all things of the present, and so far as medical attendance, for instance, is concerned, a day laborer, who is injured in a street accident, receives better medical attention gratis than Napoleon could have had from the best surgeons of his day.

The word poverty now has no such significance as it had for the people of a hundred years ago. Now, we say a man is poor when he is unable to buy diamonds for his daughter and a seal-skin jacket for his wife, but then it meant lack of bread; it was the real old fashioned, ghastly poverty, indicated by patches on the clothing and hunger in the face. The comforts of the present are the result of civilization, and

our civilization is itself a result too complex to be at present separated into its elements. But it is a fact no less curious than true that the reading farmer is a product of the present, while few reflect what is meant by the expression, "A reading farmer." Some things are not seen because they are too far off and others because they are too close, and this spectacle of the reading farmer is of the latter class. Reading is so common, books are so cheap, good light in the home is so generally the rule, that we see the farmers and mechanics of the day reading at their leisure without a thought of the significance of the spectacle. But it should not be forgotten that, at no previous time in the history of the world, was it possible for the farmer to read or for the mechanic to study, because the circumstances were all against them. This is the case not only in this instance, but in many others. Men daily travel by means of a railroad train, who never for a moment think of the labor of those who went before them to survey the route and grade the track, to lay the rails and watch the line, to build the engine and construct the cars; so, also, in the reading of the book. Men daily read who never dream of the lives spent in constant and unremunerative labor in order that they may do so—of the inventions that were brought to perfection before a printed book was a possibility.

COMFORT, LEISURE AND READING.

Comfort does not mean luxury any more than leisure means idleness, and the use of these words is at all times merely comparative. The comforts of one man may be the luxuries of a second and the necessaries of a third. What is leisure to one may be industry to another and idleness to a third. It should be understood by the farmers of the present day that they have the same right to the comforts, conveniences, and even luxuries of life, as have the dwellers in the cities. There is a wrong state of feeling among the farmers of the country in regard to this matter. They have come, unconsciously, perhaps, to form the impression that they are entitled to a living indeed, but that un-cut hair and ill-fitting clothing, thick boots and general dilapidation about the house are their portion and do not expect anything better. This is a mistake. Farmers are entitled to all the comforts and conveniences they can get, and the days for them to be somebody's drudges have gone by. The grange organizations that exist all over the country are an evidence that the farmers are beginning to learn their power, and whenever they know their strength they will control the government of the country. In every age and in every country hitherto, the class that has owned the soil has controlled the government of the country, and it would also be the situation in this

country if the farmers knew their power and were sufficiently organized to use it as it might be used.

Comfort and leisure are in these days to be attained only by large returns for little labor. It may be considered settled, that among intelligent farmers, there is to be no more fifteen-hour-a-day farming. The era for the farmer to be somebody's drudge has gone by. Neither are comfort and luxury to be secured without something to exchange for them, hence the necessity for the largest possible returns for the least labor. Nor are comfort and luxury to be had without the use of numberless articles which, under present conditions, must be bought, since they cannot be made by the farmer and those dependent on him. These articles cannot be bought without something to sell for them, and in this lies the reason for the farmers' condition a hundred years ago. He had no comfort because he had poor soil, poor tools, poor methods of utilizing the powers of nature, and consequently made a poor living, barely enough, in fact, to provide himself and family with the necessities of life. The introduction of labor-saving machines has changed all that, though it is odd to notice that not a few wise men oppose the introduction of labor-saving devices, from the fear that they would deprive many men of their means of livelihood. In China the statesmen have steadily forbidden the introduction of railroads, because it was feared that the thousands of coolies who would be thrown out of employment, by the transportation of the country being done by other means, might make no end of social strife and confusion for the rest of the people. Though this is a narrow view, it is, nevertheless, worth considering, from the fact that the general speed of the world in progress has approached more nearly the speed of its slowest members than that of its most advanced.

EVOLUTION OF THE PLOW.

The plow was at first a crooked stick, with which the savage stirred the ground in a miserably inefficient way, for the purpose of putting in his crop. Then a forked stick was perhaps found to be more efficient than a single pointed stick, and when this forked stick was shod with iron, the owner of the improved tool, no doubt, considered that he had made a great step in advance. A still further progress was made when the forked stick was drawn by some beast of burden, and a better adaptation of the tool to the intended use, was secured by the invention of a mould-board to turn the sod. In these early times the plow had but one handle, hence required the undivided attention and full strength of one man, thus the significance of the scripture expression, "he that putteth his hand to the plow and looketh back, is

not fit for the kingdom of Heaven." The next improvement was to cover the mould-board with iron, and when this was first done, many farmers could not be persuaded of the benefits of the innovation, having an idea that the iron poisoned the soil so that crops could not be raised on a field that had been plowed with an iron mould-board. After this notion had been dissipated and iron plows became common, there were great differences in plows, even the best blacksmiths often turning out inferior plows, and the only means of judging of the efficiency of a plow was to try it after it had been bought and put into actual use.

The practical inventor of the plow, as we have it to-day, was Thomas Jefferson, who first expressed, in mathematical formulae, the principles on which a plow should be constructed in order to do good work, and his explanation of the subject has never been bettered. By his formulae, it became possible for any blacksmith to make a perfect plow, since the plow, mathematically considered, consists of two wedges, a cutting and a lifting wedge, and when the angles and proportions of these wedges are properly observed, two plows made according to the principles laid down, will do exactly the same amount of equally good work. With the perfect mould-board came other improvements to the plow, one after another as they were needed, until we have the perfect plow of to-day. But the perfect plow did not come alone. With it came other perfections in farming matters. The reaper, the mower, the harvester, the binder, the thresher, the corn-planter, the corn-sheller, and the host of labor-saving devices about a farm, all have followed, not preceded, the perfect plow, for without the best possible means of cultivating the soil, all the others would be of no avail. A man who with the old-fashioned plow could break but an acre of ground a day, would have no use for a harvester, or for a reaper and binder, since he would not have the extent of farm that would justify the employment of these machines in gathering his crop, and indeed, would not have the crop to gather.

RESULTS OF THE IMPROVEMENTS.

The results of all these improvements, both in methods and in machinery, are seen in the enormously increased production of the various food gains, together with a gradual decrease in their prices. Statistics, to most people, are a weariness of the flesh, and it is not here necessary to produce them in order to make good this statement, but agricultural statistics are in abundance available to show that the case is just as stated. Notwithstanding the lower price, therefore, the increased production has more than compensated for the decrease in price, and

the condition of the farmer, on the whole, is greatly improved. Cheap wheat means cheap everything else; plentiful crops mean a plenty in all the comforts and conveniences of life; while scanty crops mean misery, or at best, self-denial, for everybody in the country where the crops are raised. An incident once occurred in England, which illustrates how completely dependent all classes are on the farmer. A farmer, tolerably well clad, was walking along the road when a merchant rolled by in his carriage. Afterwards meeting the merchant, the farmer took occasion to dilate upon the injustice of the fortune that made him a pedestrian of necessity, while the merchant, who raised nothing, lived in plenty. The merchant comforted him with the remark: "if I was compelled to walk, you would be obliged to go barefoot." It was perhaps true, and at least illustrates the fact that all classes rejoice in the prosperity of the farmer and share in his adversity. Plentiful and cheap wheat, therefore, means cheap money and cheap money means carpets on the farmer's floor and curtains on his windows, a piano for his daughter and a gun for his boy, a silk dress for his wife and a broadcloth coat for himself, a warm house for himself and a close stable for his horse, a pie for his dinner and a china plate to hold it, good shoes for his feet and a stove-pipe hat for Sunday-go-to-meeting purposes.

Such, however, is the complexity of our civilization, that no one thing of such industrial importance as the plow, for example, can be introduced without bringing with it other perfections, and so the plow has done. Labor-saving contrivances of a thousand kinds have come into daily use and so accustomed are we to them, that we never think of their necessity, nor how we should be able to get along without them. Every well arranged farm is now really a magazine which contains all that is requisite for the farmers' daily use. There is now daily to be seen in the stores that sell farmers' goods, a trace-chain link that can be applied to a broken chain, and when the chain breaks, the farmer is no longer compelled to lose half a day in going to and returning from the blacksmith's shop with his trace-chain. This is but an emblem of the hundreds of similar appliances which have followed the perfect plow. It is the first and in its train come all others.

SAVING WOMEN'S LABOR.

In order that the farmer may really enjoy his book, it is necessary that somebody besides himself should have leisure and comfort also. If a man has a wife, common decency would suggest that either he should read to her or should give her such assistance in her work as

will enable her to have time to do her own reading. So the farmer's wife must have the same amount of comfort and leisure that is enjoyed by himself. It is an old saying that woman's work is never done, and the proverb is quite as true now as it ever was, but though the work of woman is no nearer done than formerly, it has been lightened to such an extent that she no longer has the lion's share of the world's drudgery to perform as she once did. But it is well for women that with the perfect plow have come various household perfections which have tended in no small degree to lighten the work of the ladies. The sewing machine, though able to do the work of half a dozen women, has not materially lightened the work of women so far as fancy dress-making is concerned, but this is the fault of the women themselves, for, not content with the plain clothing that they formerly used to wear, they now use a hundred kinds of trimming, where they formerly used only one. But in the aggregate, the sewing machine has immensely lightened the work of women by delegating to the custom stores all the purchasers of clothing of almost every description. Women now no longer make all the clothing that is worn by their entire families, and so, at once the labor of the housekeepers is lessened and the quality of the clothing worn by their families is improved.

Another wonderful invention for women is the cooking-stove. Many men are still living who remember perfectly well when all the cooking of a family was done in the open fireplace, at an expense of fuel and of suffering to those engaged in it that was absolutely inconceivable. Nor was the cooking well done after the meals were served. With all the pains that could be taken, the meats were often burned on one side and raw on the other, the bread was heavy, the vegetables ruined by the pots in which they had been sodden, and everything had a sort of dyspeptic flavor to it, that was to be taken away only by liberal exercise in the open air. All this has been done away with. The stove and the range not only do their work more quickly, but do it infinitely better, while the steam laundry has abolished the washing day from every family in miles of its neighborhood. By means of canned fruits and vegetables, the farmer's family may enjoy summer in the midst of December, while the preserved meats and the improved methods of canning meats have almost obviated the necessity for the farmer to do any butchering on his premises. A hundred years ago there were no great ice companies that, by their competitions, reduced the price of this article to a nominal figure, and, as there were few ice-houses, ice in summer was an almost unattainable luxury. Now it can be had, almost for the asking, anywhere, and the farmer without his own ice-

house is badly off indeed. The comfort of life has also been greatly increased by the new fruits and vegetables that have, almost in our own times, come into use. A century ago tomatoes were grown in gardens as curiosities, were thought to be poisonous and were called love-apples. At that time the people had neither the cauliflower nor the egg-plant, strawberries and grapes grew wild, and though there were oranges, bananas and other tropical fruits, the lack of steam transportation made them almost unattainable by any but the very rich. Aside from all these circumstances, the women of the present day are given leisure in a hundred ways of which their grandmothers knew nothing. In former times not only all the clothing, but all the shoes and all the hats and other articles of clothing were made at home, and generally by the women. The great factories of the present have abolished this practice of home manufacture, so that, at present, it is cheaper to throw away a half worn article than to undertake its repair. Our grandfathers spent no inconsiderable portion of their time in making articles of household use, and much of the rest in repairing them when broken, but that is no longer economy.

CHEAP BOOKS.

All the comfort and leisure in the world, however, would do the farmer no good unless books were within his reach. But fortunately, the same advancement that has given him the perfect plow has given him also the perfect book. The price of books in the time of Christ was not so much greater than the prices we pay as men sometimes suppose, but the cause of the cheapness at that time is found in the employment of slave labor in the copying of books and manuscripts, and slave labor is always at once both cheap and dear. During the middle ages books were extravagantly high-priced, and the Duchy of Parma was once pawned as security for the loan of a book. But the invention of printing and the perfecting of a thousand processes by which books and their material have been cheapened, have brought books within the reach of everybody, no matter how poor. Time would fail to tell of the various inventions that have tended to this end, but among them have been steam printing, stereotyping, cheap paper, made cheap by the application of new materials to its manufacture, cheap glue for the bindings, the application of cotton cloth to this purpose, and a score of other inventions and new processes of accomplishing the same or a better result, but all looking to the indentical end, the cheapening of the product. The ten cent editions of unbound books comprise not a few works of real merit, and these are thus placed within the reach of those who never before had the opportunity of read-

ing, or better, perhaps, of owning them. These cheap editions are looked on with contempt by thoughtless persons, but a means of placing the works of Dickens, Thackeray, Scott and the other classic writers of our language in the hands of every one, is not to be despised. The quantity of matter furnished in these cheap editions is somewhat surprising. The Bible has about 800,000 words, but it may be had in this cheap form for 25 cents, while other publications are cheap in proportion.

But cheap as are these works mentioned, they do not begin to compare in price with the daily, or even with the weekly papers. In two numbers, a daily paper can print as much matter as is contained in any of them, while selling for two-fifths of the price; and an average agricultural paper, such as is ordinarily taken and read by farmers, will contain every year as much matter as would be published in twenty-two volumes of 200 pages each. The farmer is, therefore, no longer deprived by poverty of the enjoyment of reading matter, as a few cents or dollars, according to the form of the matter he prefers, will buy for him more books or papers than his grand-father ever saw. The present is, beyond all others, the reading age, and farmers, in this respect, but share with others the benefits common to the century.

CHEAP LIGHT.

All the leisure, comfort and reading matter in the world would do the farmer no good unless he had the means of reading the books he was able to buy. Hence, cheap light is quite as important for the farmer as cheap books. When we remember how our fathers were forced to get along somehow without either coal oil or gas, we cannot repress a feeling of sympathy and an emotion of wonder as to how they did it; but they seemed to do pretty well with their dipped candles, or the vilest, most ill-smelling tallow, because they knew nothing better. Their tallow candles were first dipped, then moulded, then candles were made of sperm or of wax. At present, the use of coal oil is so nearly universal that no one is compelled to use candles of any description. One good coal oil lamp will give as much light as five sperm or seven tallow candles. A gallon of oil will out-last seventy sperm or ninety-eight tallow candles. The oil is worth, on an average, from fifteen to twenty cents a gallon, while tallow candles, one hundred years ago, were sold for twenty-five cents a pound, and the sperm candles for forty-five cents. Now, candles are sold at fifteen to twenty-five cents a pound, and the coal oil will thus be about one-ninth cheaper than the candles. The difference in cost, however, is a trifle, when compared with the difference in the cheerfulness of the surroundings produced by the better light. Before the days of cheap

light the homes of the farmers were cheerless, dark, uncomfortable; there was no incentive to read when the light was so bad, and no one could afford to buy a dollar book and pay two dollars for light to read it with, consequently there was little reading done. Light, cheerful rooms make a happy childhood, and thus the general welfare of the people is improved in no small degree by the character of the light employed in their rooms. It is a curious fact that, though we have still extant the works of some hundreds of ancient authors, there are not to be found in them more than a dozen allusions to their childhood. Childhood had no charms for the youth of ancient times, because the ancients had neither coal oil nor soap, and without these two indispensables, childhood is but a mockery. Coal oil and gas have thus doubled the day, while immensely increasing the opportunities for general culture among the people. With either books or light dear, only the wealthy could read, but with both at a nominal figure, and with education universal, the farmer can read and enjoy his reading, being both pleased and profited by it and instructed as to the best means of making a better living than he ever did before.

BOOK FARMING.

As times now go, the book must guide the plow just as the book guides the locomotive and the steamship, the spindle, and regulates every other industry under the sun. Farming is a progressive science; like others of the present time, and if the farmer is to succeed, he must keep abreast of his age. The best doctors, lawyers, teachers and preachers are the men who keep up with their times and read everything in their line of business, so the best farmer is he who does likewise. No trade or profession is at present so strong as to be able to dispense with literary assistance; none is so weak as not to seek it. The literature of any trade is but the record of the successes or failures of those who have engaged in it. Men learn by their mistakes quite as much as by their successes, and sometimes better, and the literature of farming is but the record of what the farmers of the world have done for their calling. He who knows why others have succeeded and where they have failed, will be armed for success and steeled against failure. So, the book and the plow should go hand in hand, and the man who holds the one should hold the other also. The age when men could farm without reading has gone by, and the farmer who does not read will find himself so far behind his calling in everything as to render him a useless member.

RESOURCES OF MISSOURI.

The secretary is frequently called upon for information regarding Missouri, its resources, its climate, its soil, its adaptability to stock raising, the price of land, and other information that might interest intending settlers. While the Board does not esteem its function that of a bureau of immigration, yet, to give the information desired, it has sought to secure some one familiar with all the State and that has grown up with its history, to give a thorough, candid business review of its resources. Having no means to compensate for the prolonged research and time involved, I am left to offer a few facts generally called for in a brief review. The tables following this article will convey a part of the information desired.

Following these tables will be found notes from county crop correspondents, who have been asked to furnish a very brief and sober statement of the capacities of their counties. Only a partial response has been received from these correspondents.

The State is situated between 40° 30′ and 36° 30′ north and south latitude, and is 278 miles long—north to south—and 200 to 315 miles broad, and contains, in round numbers, 43,000,000 acres of land, of which 27,879,276 acres were, in 1880, in farms, of which latter amount 16,745,031 acres were improved lands. Of this land nearly one-half is in prairie and about 15,000,000 acres in forest, by estimate. It will thus be observed that Missouri has wide openings for settlers, a choice of prairie or of rolling hills, and of forests in abundance. While Missouri has lands in abundance for those needing or desiring them, it must not be inferred that the State is stationary. The following census figures will demonstrate a satisfactory growth: Lands in farms in 1870, 21,707,220 acres, of these only 9,130,615 acres were improved. In ten years the land in farms had increased twenty-eight per cent., and the improved acres in farms eighty per cent. Attention has been recently fixed upon the unparalleled resources, geographical position, and climate of Missouri, with the result that her development is now very rapid.

The forest area, abounding everywhere, that is not included in the prairie limits, affords fine timber for the arts in great abundance and variety, although confined, except in Southern Missouri, where pine covers 2,000,000 acres of ground, to the hard woods.

Fuel in the forest area, it is needless to affirm, is cheap because abundant, and covering land that agriculture is constantly encroaching upon. Nor are the prairies devoid of cheap fuel. The coal measures of the State cover immense areas and afford to these sections ready fuel at prices so favorable that, even in the forest areas, coal is in constant use.

CLIMATE.

The climate of Missouri is that of an inland State, somewhat modified by the influence of the two great rivers that flow through it, or along its borders. Its elevation above the Gulf of Mexico varies from 300 to 1,600 feet, the latter height being attained in the mountain regions of Southwest Missouri; the central part of the State varying from 600 to 750 feet in elevation. The temperature of the State undergoes the fluctuations peculiar to inland sections. While occasionally reaching a range of 50° or 60° a day, one-third of this amount will generally cover the extremes. The mean annual temperature for forty-two years, according to Dr. Geo. Engleman of the Washington University, St. Louis, is 55.5°. The winter temperature averages about at the freezing point for water, while August is stated at 76°. The extremes touch 30° below zero and 105° above, yet neither of those extremes are of long duration, the thermometer being but a very small fraction of the time below zero or at 96°. Thus, experience has taught our people to secure their ice while at three to four inches thick, rather than risk failure of getting ice at all. The dry atmosphere experienced in the inland sections of the Mississippi valley give to its winter colds less oppressive effects than in moist climates, while its summer heats are tempered by the constant breezes of the country.

A study of the death rate of the country and of Missouri will show that Missouri compares very favorably with the whole country. Its death rate is slightly greater than the United States. Its death rate from the ten great diseases varies but little from that of the country. It is well known, and is shown by the census, that the death rate is greatest among children under five years of age. The ratio of children to entire population is greater in Missouri than in the United States. A careful calculation of this factor reveals no real distinction between the death rate of Missouri and of the whole country. The ratio of

deaths from the dread disease, consumption, is much less than in the country as a whole. The death rate from all causes is one to sixty, in round numbers.

The rainfall is over forty inches in Southeast Missouri and from thirty-seven to forty inches in the rest of the State. The distribution of rainfall over the year is of more importance than absolute quantity. In this respect our rainfall is very similar to the States eastward to the Atlantic ocean. Rainfall by months, for an average of ten years, as taken from government observations: January, 2.35; February, 2.42; March, 2.13; April, 3.18; May 3.55; June 3.88; July, 5.03; August, 4.64; September, 2.75; October, 2.82; November, 2.08; December, 2.25.

MINERAL RESOURCES.

A letter, in response to my inquiries, from Prof. G. C. Broadhead, formerly on the geological survey of the State, contains the following statement of our mineral resources: "Missouri is underlaid by 23,100 square miles of coal fields, including 8,400 square miles of upper measures, 2,000 miles of middle measures and 12,700 miles of lower coal measures, or about 14,000 square miles is underlaid by measures containing workable seams in easy reach; the lower 100 feet in thickness including workable seams of good coal varying from 1½ to 4 four feet in thickness.

Copper ore is found in workable quantities in nine or ten counties.

Lead has been profitably mined in thirty counties of South Missouri.

Zinc is profitably worked in eight counties, but has been found in half of the counties of the State.

Iron ore occurs either as specular or red hematite, liminite, ochre, sulphuret and clay ironstone in nearly every county of the State, and extensive deposits of ore exist in most of the counties of South Missouri. Clay ironstone is abundant in the coal measures. One thousand square miles of South Missouri is underlaid by 50 to 100 feet of pure sandstone, easily accessible for glass making purposes. Extensive granite quarries exist in Southeast Missouri; probably one hundred square miles are exposed of good quality of granite.

Limestone and sandstone are common throughout the State; fire clays are inexhaustible."

The presence of minerals for the development of industries, cities and home markets are of the utmost importance to agriculture. Our resources, above related, are visions of future diversified industries in Missouri.

RIVER SYSTEMS.

Missouri is richly watered, offering for the future opportunities for irrigation not now appreciated. In its navigable waters it is highly favored, presenting 1,413 miles of river continuously navigable, and 697 more miles held to be navigable by the United States courts, and available at favorable periods. The Mississippi forms its eastern boundary, while the Missouri crosses its centre westward and forms its western boundary for the Northern section of the State.

Upon these two mighty rivers, standing nearly first in the world and draining valleys unsurpassed, stands in Missouri upon one of them one of the great cities of the country, St. Louis; and upon the other, one of the great cities of the future, Kansas City, already great in achievements.

These cities, numbering nearly one-half million, are admirably situated as distributing points for the richest sections of the world, and will become among the world's great marts and invaluable to Missouri.

GEOGRAPHICAL POSITION.

The central position of Missouri, in the Mississippi valley with its 12,000 miles of navigable rivers, a valley wherein is to develop the wealthiest and most powerful civilization of history; its St. Louis, at or near the confluence of two great rivers; its Kansas City, the natural distributing point of rich plains able to support a kingdom; its climate, a compromise between a northern and southern clime; its rainfall, ample and well distributed during the growing year; its fertile soil and favorable climate, adapting it to both plant and animal life; its mineral and agricultural resources, "the materials of art," and the convergence of favorable conditions for their working up into their ultimate products, the true avenue of wealth to a country; its favorable position for the trade and commerce of the valley, mark Missouri as one of the most favored States of the Mississippi valley, and as the home of wealth and greatness in the near future.

GENERAL STATISTICS.

The population in 1880 was 2,168,380, an increase of 25.9 per cent. from 1870. Since 1880 the increase of population is generally understood to be more rapid than heretofore. The following tables of State statistics show a wealth of $720,000,000 (these are assessors' figures and represent but a fraction of the State's real wealth) against $532,795,801

in 1880, indicating a rapid increase of wealth and presumably of population.

Of the character of the citizens of Missouri, it may be, with the fullest truthfulness, said that they are law-abiding, industrious, religious, lovers of civil liberty and respectors of it for others, and hospitable to a noteworthy degree.

The importance of schools is regarded of paramount importance by all Americans. Missouri has now, with one exception, the largest school fund of any State of the United States. From the report of the Superintendent of Public Schools I take the following figures:

State Public School Fund	$3,131,131 65
State Seminary Fund	469,000 00
County Public School Fund	2,128,184 67
Township Public School Fund	4,001,475 02
Special Public School Fund	72,952 15
Fines, penalties, forfeitures, etc	76,322 99
Total School Funds of Missouri	$9,879,066 48

The State debt is $14,000,000, and State taxes 40 cents on $100, light, as hereafter stated. The price of State bond is the best evidence of the happy financial condition of Missouri, being $123 on a $100 bond.

LANDS.

The extent of lands has already been related and evidence given that we have room for more farmers. The price of these lands on the assessors' basis will be seen in the following tables, to which price about 40 per cent. is to be added to arrive at their market value.

In Southern Missouri, seveal millions of acres of land are to be had from $1.25 to $5 per acre. The former are government lands in amount some over 400,000 acres. These lands are found mainly in counties on either side of the Ozark and Osage range of hills, and are wooded. While well wooded they are so well clear of underbrush that grasses and vines, suitable for stock feed, grow freely among them. The scattering settlements use these open woods for range feeding of stock, and receive great profits from the business. In the present development of western agriculture, these lands may be considered better adapted to grazing than to agriculture, although they will ultimately be found

valuable for tillage. The valleys are rich, and to a partial extent under culture. The hills can readily be converted into grass, and part of which area, if not all, into blue-grass, very cheaply, and afford profitable grazing. Their proximity to St. Louis and to markets, to the corn belt, the plentiful rainfall, their ability to sustain high-grade stock, make it probable that as much profit will be found here as on the rainless plains, which require large areas per steer, costly marketing before fat, for want of corn. The pure water of the streams of this section, and dry, airy hills, mark this section as a fitting home for sheep and for the production of good butter. While granite crops out in a section of this part of the State, sandstone and magnesian limestone underlie the greater proportion of the country.

But these are not the only lands to be found in Missouri for sale. Most of the counties offer lands, much of them cleared, fenced, under buildings and in blue-grass, at such prices, $15 to $35 per acre, that it is confidently believed that opportunities for farmers are open here unsurpassed by those offered by any other section of the West, when all the elements that go to make up the value of a home are weighed.

The soils of the sections under review, are formed from limestone and are very rich, as evinced by the growth covering them, to wit: black walnut, elm, wild cherry, hickory, the oaks, hackberry, and growth equally indictive of good lands. Some of their best blue-grass pastures, well cared for, in good seasons, will maintain a steer in good growth for eight months per acre, but this is only possible. These soils, under analyses, have shown in the subsoil unusual chemical richness, and in experiments in subsoiling have proven their value in recuperating the waning powers of the surface soil. Thus, in an experiment at the Agricultural College in 1883, subsoiling gave over 20 bushels increase of corn per acre over an unsubsoiled section, and 71 bushels per acre on unmanured lands. These subsoils are rich, calcareous clays, approaching marls, and are strongly impregnated with iron.

CROPS GROWN.

The latitude of Missouri affords a climate which, coupled with a rich and varied soil, gives a wide range of possible crops and farm products. This fact adds materially to the capacity of Missouri for the development of wealth and power. Varied crops, as well as varied mineral resources, are favorable and essential to permanent relative wealth. The presence of raw products near manufactories is recognized as an important condition to the permanency of manufacturing interests. Of the raw products of manufactures, we grow cotton in several of the southern counties, hemp, tobacco, sorghum, flax, wool,

and other minor products like castor beans, etc. It is true that flax and hemp are on the decrease in acreage from the fact that they are not now grown at a profit. Yet these fiber plants are grown here of the very best quality, our State being especially favorable to quality and growth. This fact is of some moment in view of the certainty that at no distant day the conditions will again favor the growth of fiber plants in the United States. Our climate will allow of the certain maturity of sorghum. In this volume, the chemist and sorghum expert of the National Government assures us that sorghum, as a source of sugar in the Northern States, is already an assured failure. In Missouri the climate doos not forbid us to expect to grow this cane for more than our part of the $200,000,000 of sugar and molasses that this country is just on the eve of using annually. For wool production Missouri has demonstrated her favorable conditions. The last report of this board contains proof of this in the heavy fleeces taken off at the public shearing, and the quality stands well in the cleansing reported. One of the heaviest—the heaviest average shear that I have seen on record for a considerable flock—was taken in Missouri from the sheep of H. V. Pugsley, Esq., reaching nearly sixteen pounds. The pure water and dry, rolling limestone hills of Southern Missouri are peculiarly adapted to sheep husbandry. But successful wool production is by no means confined to this section, for sheep thrive all over the State, by virtue of its sweet vegetation, the product, for the most part, of limestone soil. The exceptions to this complete adaptation of the State to sheep farming, occur on the flatter prairies and river bottoms, where drainage is needed. This exception can be mainly avoided by tiling the land.

While Missouri is favored in its capacity to produce the raw materials of manufactures, it is equally favored in the range of its staple crops of consumption, both for beast and man, and in those crops that minister to the pleasures, as well as necessities of life. Wheat, corn, oats, barley, rye and potatoes thrive well with us, each in its favored but extensive sections. Unfortunately, we have had no means of obtaining the total area in each crop for each county, and can only give totals for the State. These totals will be seen in the tables following this article.

Horticultural products, including fruits, both small and large, grow in perfection under Missouri suns. Our fruits are high-colored and well flavored. Several times, abroad, Missouri fruit has taken premiums, and the prediction is hazarded that no State will make a finer display of fruits at the Word's Fair at New Orleans than Missouri. The southern section of the State is most admirably adapted to fruit, including the peach.

FOR LIVE STOCK.

I think it may be safely said that no State in the Union offers so favorable an opening for investment in arable lands, with stock raising as a basis, (by which the products of the farm are marketed at home) as Missouri. This statement is founded upon our cheap farms, fertile limestone soils bearing the best of blue-grass, and mild winters. Wherever blue-grass has been established it has been found to rival, on its limestone soils, the famous blue-grass regions of Kentucky. This grass has a value not understood by those unacquainted with it, namely, its value for late fall, early spring, and even for winter feeding. It remains green long after frosts, and in mid-winter is green under the dead grass of the previous summer. It is green and growing in very early spring. Where a pasture is not over-cropped, cattle continue to grow on these pastures often until January. Some practice feeding these pastures throughout the entire winter, allowing the late summer growth to remain unfed for this purpose. Our winters are so temperate that few house their stock, although it should be stated that winter food is provided. Under such favorable conditions we find just expectations realized in the superior Short Horn grades of our enterprising farmers, as fine as can be found in any State of the country.

These favorable conditions have developed several importers of pure blooded animals of different breeds, while our breeders have become celebrated in the Mississippi Valley. Sheep, horses, cattle, mules, swine and poultry, are all successfully bred and fed in Missouri. The ease with which corn is grown, here, gives a superabundance of cheap corn, the cheapest fattening food of the world, to encourage the fattening process in its perfection in Missouri.

WANTED.

Only industry, good habits and capital are wanted here; nor is it a place where fortunes "turn up" to those standing around. The conditions named are all very favorable for skill, industry and capital. To those who use these factors a good growth with the fortunes of our State will be assured. Mere adventurers will find plenty of folks here quite as smart as themselves, with settled purposes in life and quite competent to pick up any fortunes that may lie on the surface. Thee hasty, yet not thoughtless remarks, have not been written with an overpowering desire for immigrants. The children of the State will soon work our idle lands, as will the children of the country the few

remaining good acres left to the National Government. I have simply attempted to answer a frequent inquiry at this office in a spirit of fairness, and to say to those desiring homes, that Missouri affords room for much of the surplus industry and capital of other sections ; that its resources are admirable, its people law-abiding and hospitable, and that morals, capital and industry will be welcome to the State and to society, and will be protected in the legitimate pursuit of fortune and happiness.

The following address of Prof. G. C. Broadhead is of interest in connection with this article, and also of general interest :

THE RELATION OF THE SOILS OF MISSOURI TO GEOLOGY.

LECTURE DELIVERED IN THE UNIVERSITY CHAPEL, MARCH 29, 1884, BY G. C. BROADHEAD, OF PLEASANT HILL, MO., FORMER STATE GEOLOGIST.

My main object in the following will be to show the relation geology has to soils as proven:

1. By the erosion of rocks, supplying the material which composes our soils.

2. The underlying geological strata gives character to the overlying soil.

3. The growth of plants and trees is an index to the geology.

The plan of the subject, involving so much of interest, would, if fully carried out, expand into several lectures. I shall, therefore, only touch lightly on some features.

If, upon some pleasant day, we should start out and travel as much as thirty miles, using only ordinary observation, we could but notice the variety of vegetable growth of different places upon our route, not only the diverse native growth at points apart, but also the difference in the growth of the cultivated crops. A person unaccustomed to country life, might expect a strict monotony, but he would be immediately struck with the remarkable diversity, both of scenery and of the growing crops.

Now, why is this difference? In the first place the soil is different. If the soil was all exactly alike, all other things being equal, both as to composition and cultivation, the natural growth, as well as the crops at different places, would be similar.

But we know at a glance that great differences may exist within a short distance apart. At one place the soil may be of a light color; at another place of a dark color; at one place it may be only a few inches in depth, at another place, much deeper; at one place the subsoil may approach very near the surface; at still other places there may be

only a few inches of subsoil between the soil and the solid rock; and the underlying rock may be sandstone, a limestone, a clay shale, a flint or a granite.

We thus perceive that there are many causes producing soils of different character, as shown by the variety of vegetation.

Where limestones prevail, our soils are calcarious or limestone soils; where sandstones prevail, the soil is sandy; where chert, or flint or granite prevails, the soils are chiefly silicious; if the granite decomposes much, the soil may be termed sandy. In the vicinity of iron ore as well as where the limestones contain much iron the soils are often quite red in color, and may be termed ferruginous.

Some years ago, I noticed that the soil of Tuque creek, in Warren county, was of a peculiarly red color. My examinations soon proved that the deep red color was due to the presence of iron ore in certain limestones cropping out near the head of the stream.

Marked peculiarities of soils can generally be traced to similar geological causes.

As the composition of soils varies, so will the natural growth differ; stripped of this growth, the crops raised upon the different soils will also differ.

Fresh soils are both of vegetable and mineral origin. They result in the first place from disintegration and subsequent decomposition of the neighboring and underlying rocks. Decomposed leaves, grass and other vegetable and animal matter mingle with the debris, and our soils are formed.

Rocks, as we view them, in cliffs, precipices, mountains and caves, seem hard and solid. Without thought, we might imagine them to be fixed there forever. But facts disclose many changes. Some rocks, to be sure, seem almost unimpressible, against which the elements, as well as chemical agency, have waged war for ages with apparently but little effect. But most of the earth's strata has been subject to great convulsions. Earthquakes, even in our time, have caused tremendous throes and oscillations of the crust. But long previous to the period of man's existence, the earth was subjected to numerous foldings, pressing and upturning of strata, by which the various mountain chains were ushered into existence and the river channels formed.

If we examine the bluffs along any large river passing through a very hilly country, we will find strata on one side of the stream strictly corresponding in composition and arrangement with strata several miles away upon the other side of the stream. We know from this that there was a time when these rocks extended quite across from bluff to bluff without a break. What a mighty force, then, must have

been exerted to sunder these strata, to break the fragments into lesser pieces and bear them away.

Internal force sundered the strata. The waters afterwards assisted the process of disintegration; especially was this so in the early period of our earth's history, when the waters lay deep over the land, and the currents were rapid and strong. Huge rock masses tumbled into the seething waters. Strong currents undermined the strata, and more fragments of rock went the same way, and were ground and rubbed against each other and borne onward by the rapid streams, grinding and rubbing, and scratching against numerous other rocks, until they are finally reduced to powder, which is borne far away, and as the waters subside, is deposited on the adjacent shores, the beginning of a soil.

The disintegration was begun by aqueous forces, but has continued through many ages by atmospheric agency.

A great deal might be said about the erosion of the rock strata of Missouri, but I shall only briefly discuss certain features which have a proper bearing upon our subject.

The greater portion of the State of Missouri lying south of the Missouri and Osage rivers is rough and broken. The principal rocks of the Ozark plateau are limestones, often in thick beds and of a hard, dense structure. Nevertheless, valleys have been worn in these rocks to a depth of 200 to 400 feet, and the difference of elevation between the low bottoms of the larger streams and the summits of the distant dividing ridges is often as much as 500 to 700 feet. The erosion of this district as well as the subsequent atmospheric agency, therefore, must have been very great.

If we draw an irregular line across the map of Missouri from Clark county, in the northeast, to Jasper, in the southwest, we find that nearly all of that portion of the State lying west and northwest will be underlaid by the upper carboniferous rocks. Between these and silurian rocks of the Ozarks we find a narrow belt of lower carboniferous rocks consisting chiefly of limestones, which, apparently, have not been subjected to as great an erosion as the magnesian limestones of South Missouri, for the reason, probably, that they have not been in existence so long. As the lower carboniferous rocks are chiefly limestones, so do we find here a calcareous soil. The silurian rocks of South Missouri being chiefly magnesian limestone, the soils will also be found containing magnesia and lime.

The soils overlying the upper carboniferous or coal measures have a little more diversity of character. In the lower coal measures, consist-

ing chiefly of sandstones or clay beds, with but few beds of limestone, the soils there formed will be either sandy or clayey. When clay beds or clay shales prevail, the country is inclined to be flat; when sandstones prevail, the hills are generally rounded. In the region of the upper coal measures, there being a greater alternation of sandstones with limestones, the surface of the country is more often rolling or undulating. There also being more limestones, they give a marked character to the soil.

A peculiar feature of the upper carboniferous group is the existence at long intervals of lone mounds, also of occasional ranges of mounds, the latter, often, the remnant of broken ridges. They often occupy an elevation of 70 to 125 feet above the general surface of the adjacent country and are more often formed of sandstone and shale beds with cappings of limestone. They are sometimes near, at other times miles distant. Disturbances of the earth's strata, as well as frosts, have assisted in breaking the cap rock through which waters have found a way to the underlying sandy and clay shales, which are soft and easily worn away. Currents have washed out the material from under the projecting limestone which, soon, by its weight, falls off and the wearing away continues until but a small space remains on top, and the mound is left as a lone sentinel reminding us of past ages, and as a mark for the traveler to be guided by. These mounds can be traced along the margin of the lower and middle coal measures from Barton, through Vernon, Henry, Johnson, Lafayette, into North Missouri.

Another series of mounds follows the boundary between the middle and upper coal measures which can be readily traced from Bates, through Cass, Johnson, Lafayette, Ray, Carroll and Livingston. These mounds are invariably capped with limestone, with beds of sandstone below, and rarely has the limestone capping been removed.

The mounds are connected with the lower plains and bottom lands by long gentle slopes, the fertility of which cannot be surpassed. The soil is also continually renewed by accessions of the eroded material from the mounds above. The mound system combines beauty and utility. From their summit the view is often magnificent. Looking below, we see dotted here and there neat farm houses, well cultivated fields, growing crops, grazing cattle and villages from ten to twenty miles away; and sometimes, nearly as far off, there rises another blue capped mound. All these things constitute the peculiar charm attached to life upon the prairies, and when we gaze upon the other mounds in the distance we go to thinking, and say: "How great the forces of nature are." Here are two mounds, say, five miles apart they are capped by identically the same kind of limestone, for it is of

the same color and texture, and is homogeneous and contains the same species of organic remains. In ages long ago, these mounds were united without a break between, now they are separated by an area, whose vertical cross section, we may say, is a base on top of five miles, on bottom of four miles, and distance between of 125 feet. It is very easy to calculate the cubic contents. The other factor may be the length of a prismoid many miles long. But it has long since been removed, much of it has been borne many miles away, a portion has formed the subsoil, or mingled with the soil as it was borne along, and some has even been carried off several thousand miles, and now lies quietly on the ocean bed.

CHEMICAL AGENCY.

Besides aqueous and ærial agency, chemical agency has done much in dissolving the rock strata, and has sometimes operated on a grand scale. Evidence shows that at our lead mines underground currents of water, containing minerals in solution, have dissolved the limestone and chert. The limestones have been dolomised and subsequently dissolved. Dolomitic sand or powder is common at many of the Southwest Missouri mines, also at some of those of Central Missouri.

In Madison county, a well was dug 75 feet through decomposed granitic rocks, yet at a former period this was solid granite. The porphyrys at many places have been altered to clays, the cherts also to a good potters' clay, many feet in depth. These deposits are also often concealed by several feet of a talus of broken fragments of rock, either porphyry or chert, which have been loosened by the frosts from the higher cliffs, and lies tumbled on the slopes below.

Rocks containing much clay in them, when first quarried, may firmly adhere, but they readily slack after the first rains, the more clay in their composition the sooner will they decompose. Some rocks absorb a good deal of moisture; if such are exposed to the frosts of winter they freeze, and, on thawing, break up in many pieces.

You thus see how our soils may be formed; the rock is disintegrated by frosts, decomposed by rains, or dissolved by acids; ground together by strong currents of water, formed into a fine powder, either borne off by the winds or carried away by the waters; it subsequently is mingled with decomposing vegetable matter, and our soils are formed. Where the rocks are chiefly limestone, sandstone or shales, the soils are more or less pulverulent, but in flinty or granitic regions, or regions where eruptive rocks prevail, fragments of these rocks of small and of

large size are often encountered, and it is very common to see piles of stones scattered over the fields.

In a chiefly rock-exposed region where, since their genesis, neither seas nor lakes have rested to leave any sediment, the soils are necessarily of little depth, and are generally poor. Of such are most of the soils occupying the highlands of South Missouri, notably the Ozarks. The Ozark plateau has a nucleus of Granite and Porphyry, upon which rests the older Silurian rocks, composed of sandstone and magnesian limestone, with some interstratified chert beds. The soils where the granite, or the sandstone, or the chert prevails, is silicious and generally not very productive, and fragments of these rocks are often found mingled with the soil. On such soil are the pine forests, with sometimes black oak and black hickory. Where there is little or no pine, but some oaks, there is also a luxuriant growth of tall grass, and where not much grass but many rocks, we find the huckleberry.

But in this same neighborhood are also thick beds of magnesian limestones which give evidence of erosion chiefly through atmospheric agency for many long ages, as evidenced by their rough surface. The soil upon most of the adjacent lower lands as well as some soils high upon the ridges is largely formed of the comminuted debris from these magnesian limestones. The resultant soil supports a luxuriant growth of trees and vines. When of but little depth we often find groves of red cedar. In the early Quaternary Period, a lake, probably of fresh water, extended eastwardly into Ohio, limited on the south by the Ohio river, and in Missouri extending to the south bank of the Missouri river. These waters extended far to the north, far enough, in fact, to reach the climate of ice, for upon these waters huge masses of ice floated laden with a heavy freight of clay, sand and boulders of rock. Reaching a warmer climate the ice dissolved, and the solid matter was deposited upon the ground. As the waters receded a great deal of sediment was deposited. This was the beginning of the subsoils over the greater part of north Missouri. This Drift deposit in some places, especially in its lower part, consists of a very tough blue clay; in other places there is more sand. Just below the subsoil we often find a brownish or gray clay, often very calcareous, and I have often observed, that when mingled with the top soil, it improves it very much.

At a little later period than the Drift, the channel of the Missouri river was obstructed; when these obstructions were removed, the waters fell, and left exposed upon the adjacent hills and slopes extensive deposits of finely comminuted material, consisting of a mingling in good proportion of sand and clay, with some lime previously washed down from the far off head waters. This has bean termed the Loess or

Bluff. In the northwest part of Missouri, it forms steeply rounded hills. Lower down, it supports a luxuriant growth of vines and various trees, and when cultivated, forms some of our best soils.

We thus find that the quality of our soils very much depends upon the character of the underlying Geological formation. Where sandstones prevail, the crops will suffer during severe drouths, but with frequent rains, are more productive. A soil formed entirely of clay, also suffers during dry seasons.

At, and around coal mines, there is a good deal of clay cast out upon the surface, and we have a poor soil. At lead and iron mines, the vegetation is often very luxuriant.

All of the bottom soils are productive. Those of South Missouri contain a greater number of pieces of rock, as well as much sand and gravel. The sands and gravel serve to digest the various alluvial deposits, keep the soil moist and loose, and the result is a superior soil. Along most of the larger streams of North and West Missouri, are often wide flat prairie bottoms, formed of deep black clay, and containing a little iron. These dark clays were formed just after the Loess of the Missouri river, and previous to the forming of the present alluvium. They contain but little sand, are very tough and are from twenty to thirty feet thick. When these bottom lands are well cultivated, they are very productive.

The soil of the Missouri bottoms is somewhat different from other soils, and as such, deserves a passing notice. It is composed of finely comminuted sand and clay, with some humus.

In 1844, the Missouri bottoms were overflowed and covered to a greater depth than had been previously or has been since known. During that flood large deposits of sand were formed, and for several years thereafter no crops could be produced. Corn was planted, but no ears were formed. Since then, these sandy lands have gradually improved, and on fields where wagon wheels for several years after would sink over six inches in the sand, at the present time heavy crops of corn are annually produced.

This forcibly illustrates the imperishable nature of these alluvial soils. In less than twenty years the soil of the Missouri bottoms was reproduced, and the only aids to reproduction have been the decaying vegetable matter with slight washings from the uplands.

Our alluvial soils are the most productive, and include those of the bottom lands along the various streams, as well as those of the so-called swamps of Southeast Missouri. These soils are inexhaustible. They are of different ages of deposition; that nearest the stream is generally subject to annual overflow, has often more sand, as well as a larger pro-

portions of decayed leaves and remains of decayed vegetation in its composition, and the annual growth upon it is very luxuriant.

The valleys of the larger streams rise by terraces, the lower terrace being subject to annual overflow, the terrace next above is rarely overflowed, and the next still above, is never overflowed. Sometimes there are two terraces, sometimes three, and the second terrace is often situated above any overflow.

The drift clays overlie most of north Missouri to a depth varying from thirty to eighty feet in the southern and western extension and fifty to one hundred and seventy-five feet in the north and northeast. The Loess is not so deep.

As we approach the interior of Western Missouri, where neither the Loess nor Drift is well developed, the limestones have generally a capping of four to eight or ten feet of clay, black near the surface, of a yellowish or reddish brown below, it being the residuum of the rocks decomposed *in situ*. Over the hills of South Missouri, the rocks are only covered with a few feet of clay, but they also more often lie bare upon the surface.

In Southwest Missouri, the rock lies very near, or at the surface. Excavations on prairies in Jasper county show only one foot of soil above the gravel, with limestone rock at three and a half feet from the surface. The growth upon a soil is often a guide to the geological formation just beneath. In Southwest Missouri and Southeast Kansas, where only a scrubby growth of chiefly black jack oak is seen, our experience tells us that the underlying rock is sandstone. But in Southwest Missouri, we find a more vigorous growth of black jack oak, associated sometimes with post oak and black hickory. Our experience here, also, tells us that there is a good deal of chert or flint in many broken fragments intermingled with the soil.

In North and West Missouri a growth of chinquepin oak shows us that there are limestones near the surface. At other places, certain bushes and smaller plants are indicative, at first glance, of a particular geological horizon. I even remember that, many years ago, following along Shoal creek, in Newton county, examining the various limestone bluffs, that I noticed a particular plant always rested upon a certain limestone, and from afar, I would be guided by it, and knew what rock to find.

As we pass from the sandy soil of Barton and enter Jasper county, with its limestones and chert, we observe a very marked change in the flora.

In Western Missouri, many plants may be certainly looked for near certain limestone beds. Seeing the plants I know what rock to

look for. In other parts of the State we are similarly guided. In Southwest Missouri and Southeast Kansas a species of helianthus always grows upon certain limestone beds of the upper carboniferous, by which means the rocks are often recognized at a distance. There is also a limestone of less than twenty feet in thickness around which there cluster about ten species of plants rarely found elsewhere. Such is the intimate relation of geology and botany; and the facts afford a very interesting study.

Some portions of our State are well adapted for certain crops, other portions are favorably suited to the growth of other crops. Of this I shall not say much; but I desire to mention certain parts of the State rendered by nature peculiarly productive.

Northeast Missouri includes many tracts of naturally very productive soil, which has, by a judicious system of farming, been rendered more so.

In Southeast Missouri we find about 3,000 square miles of almost quite flat land through which sluggish streams meander, with occasionally some ponds and marshes. This is interspersed with a few prairies, but, excepting when cultivated, is chiefly clothed with a dense growth of tall and straight trees which afford the best of timber. This part of the State is generally spoken of as the "swamps of Missouri," but it really embraces large tracts of land with very superior soil growing seventy-five bushels of corn to the acre, and fine crops of cotton, not to speak of the industry in watermelons created within the past few years.

In Northwest Missouri, there is another district, including thirteen counties lying west of Grand river and north of the Missouri, and four counties south of the Missouri. The general surface of these counties is rolling and undulating with no flat uplands, and not often heavily timbered, excepting along the streams. The bottoms along the various streams are wide and rich, the soil upon the uplands is deep and black, endurable for ages and susceptible of the most improved system of cultivation, capable also of abundant yield of both corn, wheat and grass. Once, and not many years ago, that part of the State was a wide expanse of prairie, now it is a matchless garden spot, where happiness, health and prosperity ceaselessly reign.

Before closing, I would refer to the assessed value of property in certain counties as per assessment of 1883.

In 1860, I rode across the county of Atchison, and for over fifteen miles saw neither dwelling nor farm. Now the lands of this county in assessed value are sixth in order from the highest. Three counties, St. Louis, Jackson and Buchanan, contain large cities. The assessed value of property in Atchison is $11.97.

Ten counties in Northwest Missouri have an assessed valuation of over $10 per acre. Those from Clay county northwest, are all rated over $10 per acre, those back from the river not quite so high. Now all of these counties are underlaid by rocks of the upper carboniferous system, and all but two of them by the upper coal measures. Furthermore these counties have also overlying them the most extensive deposits of "Bluff" or "Loess" clays quite calcareous and often a little sandy. Another aid to the fertility of the river counties is the evaporation and subsequent precipitation of moisture which becomes less as we recede from the river.

Referring again to the assessment reports, I find that the valuation of property in the counties of central North Missouri is not much over one-half of the assessed value of the northwest river counties, as shown by the returns of Linn, Macon, Adair and Monroe, valued from $4.70 to $5.92.

These counties have subsoils based upon the drift. Farther west the value of lands in Daviess, Caldwell, Worth and Gentry, varies from $6.70 to $8.60. We find some drift clays in these counties, but much less than in those lying east. But the rock formations are all of the upper coal measures and the soils therefore of better quality.

The returns of the assessors cannot be considered strictly correct, but may serve as a scale for comparison—and as such the recent returns can be used.

One-half of the State of Missouri is good farming land, and one-fourth of the State embraces as good land as may be found anywhere.

STATE VALUATION OF LIVE STOCK, ETC.

The State Auditor, Hon. John Walker, has kindly furnished the Board of Agriculture the official figures and facts for 1883, seen in the following table: "The assessed value of the property of the State is about $720,000,000. Upon this a levy of twenty cents on $100 is made for general revenue, one-fourth of which is set apart for common schools; the balance, if any, goes to the sinking fund; also a levy of twenty cents on $100 for interest and sinking funds. The counties, cities, etc., make their levy." It is understood that about forty per cent. is to be added to the official valuation for taxation to arrive at the true value of the taxable property or the property actually taxed.

ABSTRACT OF ASSESSMENT RETURNS from the several counties of the State of Missouri, as equalized and adjusted by the State Board of Equalization for the year 1884, showing the number of acres of land, town lots, the average value per acre, the number of horses, mules, asses, jennets, neat cattle, sheep and hogs, and the average value of each, all other personal property and total taxable wealth.

REAL ESTATE.

COUNTIES.	LANDS.			TOWN LOTS.		
	No. of acres.	Average value per acre.	Valuation.	Number.	Valuation.	Total value of real estate.
Adair	362,420	$4 71	$1,706,679	1,972	$385,545	$2,092,224
Andrew	270,112	10 24	2,773,455	2,510	330,620	3,104,075
Atchison	325,778	11 97	3,900,975	1,890	232,390	4,133,365
Audrain	433,100	7 46	3,232,415	3,283	672,980	3,905,395
Barry	379,120	3 30	1,251,540	3,566	88,222	1,339,762
Barton	368,522	7 08	2,609,692	1,850	538,273	3,142,965
Bates	538,971	8 60	4,637,312	5,286	892,850	5,530,162
Benton	401,832	3 94	1,583,750	664	112,660	1,696,410
Bollinger	355,238	3 54	1,260,070	581	57,525	1,317,595
Boone	422,266	7 54	3,180,995	4,802	831,060	4,012,055
Buchanan	248,107	12 99	3,223,970	18,000	7,857,410	11,081,380
Butler	872,254	1 73	647,583	.....	112,330	759,913
Caldwell	272,850	8 60	2,345,789	2,855	866,142	2,711,931
Callaway	512,311	5 58	2,859,570	1,778	597,450	3,457,020
Camden	218,883	2 00	438,744	708	11,194	449,938
Cape Girardeau	352,161	4 98	1,753,680	2,208	579,440	2,333,120
Carroll	436,602	8 52	3,719,179	2,724	503,105	4,222,284
Carter	314,450	1 51	175,,493	91	4,805	480,298
Cass	441,644	8 40	3,707,054	6,489	533,818	4,240,872
Cedar	301,251	4 09	1,234,022	.....	114,714	1,348,736
Chariton	462,900	6 01	2,782,756	8,448	468,451	3,251,207
Christian	229,496	2 87	659,538	1,094	42,139	701,677

Clark	318,817	6 18	1,972,930	4,090	144,690	2,117,620
Clay	247,521	10 96	2,713,277	2,595	888,329	3,101,606
Clinton	265,355	11 38	3,019,645	3,655	715,820	3,735,465
Cole	234,672	4 66	1,092,722	3,085	1,044,645	2,137,367
Cooper	351,781	8 30	2,910,200	1,573	734,420	3,644,710
Crawford	437,821	2 31	1,009,440	578	85,582	1,095,022
Dade	312,686	4 04	1,263,386	1,500	116,848	1,380,234
Dallas	238,853	2 74	655,778	299	54,163	709,941
Daviess	358,380	6 90	2,473,443	2,482	369,059	2,842,502
DeKalb	266,677	9 35	2,494,651	1,170	192,810	2,687,461
Dent	448,491	1 78	805,665	633	114,235	919,840
Douglas	200,595	2 28	457,267	100	4,990	462,257
Dunklin	160,624	3 19	513,591	365	61,835	575,426
Franklin	544,578	4 85	2,585,940	5,506	673,895	3,259,835
Gasconade	319,838	4 39	1,406,860	2,260	223,656	1,630,516
Gentry	307,064	7 63	2,344,970	.....	427,040	2,772,010
Greene	426,443	6 78	2,886,025	11,515	2,025,769	4,911,794
Grundy	278,878	6 49	1,777,917	1,284	477,335	2,255,252
Harrison	458,057	5 88	2,696,584	2,104	339,006	3,035,590
Henry	460,310	5 84	2,687,230	3,965	632,730	3,319,960
Hickory	208,338	3 82	797,451	520	37,880	835,331
Holt	277,010	10 13	2,805,605	4,043	398,070	3,203,675
Howard	286,923	8 33	2,390,300	1,781	525,395	2,915,695
Howell	279,714	2 51	703,060	469	99,920	802,980
Iron	320,803	8 43	1,099,760	1,797	262,110	1,361,870
Jackson	379,401	25 60	9,714,445	28,178	25,174,610	34,889,055
Jasper	403,134	8 97	3,615,812	9,815	1,725,585	5,341,397
Jefferson	403,613	4 74	1,912,800	4,221	499,541	2,412,341
Johnson	520,546	11 4	5,934,005	3,800	889,850	6,823,855
Knox	323,289	4 84	1,566,545	1,814	188,834	1,755,379
Laclede	374,339	2 74	1,025,085	1,709	204,255	1,229,340
Lafayette	393,775	13 56	5,341,790	6,850	984,390	6,326,180
Lawrence	380,157	4 12	1,566,140	2,194	254,561	1,820,701
Lewis	321,380	6 80	2,187,005	4,277	428,140	2,615,145

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

REAL ESTATE.

COUNTIES.	LANDS.			TOWN LOTS.		
	No. of acres	Average value per acre.	Valuation.	Number.	Valuation.	Total value of real estate.
Lincoln	$390,813	6 53	$2,549,810	1,782	$195,250	$2,745,060
Linn	389,159	5 67	2,006,496	3,960	544,755	2,751,251
Livingston	330,785	6 70	2,217,508	2,553	605,450	2,823,258
McDonald	242,319	2 65	643,192	916	52,207	695,399
Macon	518,150	5 29	2,744,802	5,249	638,394	3,383,196
Madison	272,475	3 45	941,842	324	160,220	1,102,062
Maries	320,492	2 34	753,720	412	22,354	776,074
Marion	274,932	10 70	2,942,935	7,028	2,452,715	5,395,650
Mercer	288,072	4 93	1,421,875	1,480	156,480	1,577,855
Miller	343,875	2 48	855,515	505	103,871	959,386
Mississippi	247,761	3 25	794,087	2,649	162,015	956,102
Moniteau	258,590	6 25	1,615,575	1,247	358,070	1,973,645
Monroe	419,735	5 92	2,485,490	1,085	318,950	2,804,440
Montgomery	328,356	4 56	1,496,323	2,360	310,490	1,806,813
Morgan	385,919	3 07	1,183,896	555	74,175	1,258,071
New Madrid	300,609	2 52	768,100	849	79,330	847,430
Newton	379,287	5 23	1,982,970	3,206	263,740	2,246,710
Nodaway	554,366	9 65	5,347,855	4,790	1,039,978	6,387,833
Oregon	374,600	1 44	540,937	.....	26,095	567,034
Osage	368,734	3 36	1,238,936	1,021	101,950	1,340,886
Ozark	85,307	2 69	229,384	58	6,265	235,649
Pemiscot	244,154	2 41	588,640	139	25,035	618,675

Perry	293,704	4 18	1,227,883	553	127,643	1,355,526
Pettis	427,000	9 09	3,884,790	4,700	2,060,890	5,945,680
Phelps	381,086	2 71	1,085,236	682	254,190	1,289,426
Pike	419,628	8 12	3,327,430	2,788	1,073,450	4,400,880
Platte	258,080	10 36	2,673,705	3,790	66,118	2,739,823
Polk	414,529	8 37	1,396,268	733	153,375	1,349,643
Pulaski	184,382	2 26	417,670	1,094	114,105	531,775
Putnam	329,473	3 71	1,232,416	1,479	107,472	1,339,888
Ralls	303,846	7 48	2,272,760	688	68,235	2,340,995
Randolph	304,432	7 68	2,321,973	5,435	789,513	3,111,486
Ray	355,613	8 25	2,933,100	3,528	380,972	3,314,072
Reynolds	485,674	1 75	706,927	262	8,466	715,393
Ripley	340,330	1 86	633,045	170	36,140	669,185
St. Charles	343,685	12 44	4,275,680	2,396	1,189,935	5,465,615
St. Clair	419,366	5 00	2,094,918	2,983	255,863	2,350,781
St. Francois	281,840	4 60	1,297,038	1,842	159,527	1,456,565
Ste Genevieve	302,663	3 75	1,135,251	1,460	293,115	1,428,366
St. Louis city	19,945	.....	11,395,780	84,447	169,132,120	180,527,900
St. Louis	291,710	53 00	15,461,710	5,865	674,290	16,136,000
Saline	461,138	11 58	5,343,925	6,450	997,499	6,341,424
Schuyler	195,186	4 71	920,631	4,245	138,611	1,059,242
Scotland	280,105	5 65	1,583,741	1,155	145,730	1,729,471
Scott	260,912	4 08	1,065,224	2,196	186,344	1,251,568
Shannon	545,208	1 19	649,876	155	5,127	655,003
Shelby	314,880	6 26	1,973,195	1,530	323,400	2,296,595
Stoddard	480,169	1 79	858,803	700	60,355	919,158
Stone	147,016	2 05	302,850	.....	4,241	307,091
Sullivan	413,135	4 41	1,825,398	2,213	196,881	2,022,279
Taney	80,897	3 54	206,001	338	12,474	218,475
Texas	440,070	1 90	837,712	630	33,750	871,462
Vernon	527,075	6 09	3,210,892	5,691	686,397	3,897,289
Warren	250,010	4 13	1,033,503	807	81,295	1,114,798
Washington	454,830	3 80	1,687,417	1,350	182,510	1 869,927
Wayne	477,517	1 60	782,930	.....	92,710	875,640
Webster	331,303	2 98	987,789	1,861	125,547	1,113,286
Worth	171,376	6 90	1,182,761	828	126,480	1,309,241

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

REAL ESTATE.

COUNTIES.	LANDS.			TOWN LOTS.		
	No. of acres.	Average value per acre.	Valuation.	Number.	Valuation.	Total value of real estate.
Wright	278,280	$2 84	$777,448	499	$47,989	$825,437
Totals	39,056,563		$248,570,669	383,035	$248,570,669	$492,489,338

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

LIVE STOCK.

COUNTIES.	HORSES.			MULES.			ASSES AND JENNETS.		
	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.
Adair	7,432	$29 36	$218,250	626	$35 13	$21,995	38	$32 88	$1,085
Andrew	8,664	47 28	409,620	1,642	64 53	106,065	83	62 83	5,215
Atchison	7,300	23 10	168,679	2,411	45 63	110,030	21	50 00	1,010
Audrain	8,600	36 88	314,105	3,085	46 05	142,085	84	48 09	4,040
Barry	5,565	36 38	238,875	1,454	55 90	81,337	55	48 00	2,635
Barton	6,925	33 00	228,403	1,695	42 52	72,080	43	50 47	2,170
Bates	12,854	32 9[illegible]	423,280	2,402	44 72	107,437	90	68 00	6,120
Benton	6,313	37 61	237,435	1,313	48 20	63,255	45	52 11	2,345
Bollinger	3,425	49 87	170,815	1,211	57 05	69,095	31	65 32	2,025
Boone	8,000	35 73	286,825	3,230	48 16	156,570	112	78 61	8,805
Buchanan	7,785	42 38	329,975	2,749	63 23	173,830	.....	.....	.....
Butler	1,140	38 66	44,076	460	41 30	19,001	14	27 28	382
Caldwell	8,613	41 14	354,379	1,135	45 54	51,781	32	55 31	1,770
Callaway	8,519	40 52	345,205	3,606	53 12	191,555	137	78 10	10,700
Cadem	2,725	40 65	110,773	727	48 32	35,128	38	16 52	628
Cape Girardeau	4,971	33 84	169,435	2,372	36 27	86,150	51	51 17	2,610
Carroll	10,844	38 38	416,175	3,705	48 83	180,931	.....	.....	.....
Carter	664	49 35	32,770	346	71 40	24,805	8	49 37	395
Cass	11,471	39 07	448,211	2,413	54 67	131,932	.....	.....	.....
Cedar	6,254	36 66	229,309	1,452	47 38	68,800	54	54 37	2,936
Chariton	10,128	30 19	305,814	2,728	41 55	113,361	71	50 56	3,590
Christian	3,66[illegible]	41 12	150,715	1,227	40 85	50,127	31	44 00	1,360
Clark	7,365	31 00	228,305	779	39.07	30,870	27	27 41	750
Clay	6,565	37 61	246,906	1,692	46 32	78,386	60	84 33	5,060
Clinton	7,540	35 79	269,857	1,848	48 45	89,347	64	60 00	3,820

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

LIVE STOCK.

COUNTIES.	HORSES.			MULES.			ASSES AND JENNETS.		
	Number.	Av'r'g value.	Valuation	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.
Cole	3,078	$39 39	$122,265	1,308	$46 10	$61,110	10	$40 50	$405
Cooper	6,985	45 00	314,945	3,993	58 13	232,120	76	62 63	4,760
Crawford	2,976	33 10	98,514	1,278	45 60	58,282	65	30 00	1,927
Dade	6,703	36 61	240,804	1,658	44 10	72,145	26	63 54	1,652
Dallas	4,331	43 48	188,318	1,061	46 18	48,993	44	35 00	1,540
Daviess	11,193	38 64	432,556	1,187	46 77	55,520	56	66 00	3,674
DeKalb	7,996	40 36	322,754	947	54 69	51,790	34	46 00	1,550
Dent	2,672	34 00	88,800	1,027	43 46	44,641	40	26 88	1,075
Douglas	2,727	44 00	119,219	538	50 00	26,740	33	60 00	1,005
Dunklin	2,227	42 00	93,442	1,272	53 46	64,085	20	38 25	765
Franklin	5,702	36 52	208,270	3,699	41 52	153,580	34	39 26	1,335
Gasconade	2,737	41 95	114,837	2,081	51 16	106,473	24	44 17	1,060
Gentry	9,387	34 14	320,585	788	43 34	31,975	31	60 00	1,830
Greene	9,406	42 73	402,255	2,623	49 10	139,911	77	60 31	4,645
Grandy	6,687	38 38	256,656	792	43 01	34,164	38	40 00	1,500
Harrison	12,603	36 37	458,574	1,052	41 42	43,577	38	65 26	2,485
Henry	10,700	37 03	396,243	2,663	43 70	116,480	70	48 93	3,425
Hickory	4,236	49 00	207,567	654	58 13	38,021	41	40 01	1,644
Holt	5,990	42 10	252,205	2,009	47 25	94,950	34	50 44	1,715
Howard	5,489	40 51	222,355	2,695	57 01	153,660	43	78 23	3,150
Howell	2,905	37 90	110,133	1,256	45 55	57,220	25	37 00	920
Iron	1,336	42 10	56,245	688	54 14	37,250	22	45 00	990

Jackson	12,746	50 39	642,290	3,459	64 40	228,870				
Jasper	9,581	37 07	358,384	2,802	51 48	118,511	34	50 29	1,710	
Jefferson	4,008	40 07	160,600	2,233	46 82	104,451	38	24 26	922	
Johnson	11,349	43 00	487,920	4,007	58 95	236,205	51	76 47	8,900	
Knox	8,104	31 40	254,498	864	37 32	32,249	25	48 40	1,210	
Laclede	4,340	41 75	181,190	1,077	48 08	51,780	54	48 61	2,625	
Lafayette	10,498	38 26	401,600	4,876	45 62	222,440	48	86 77	4,165	
Lawrence	7,193	42 46	305,389	2,067	53 19	110,941	44	80 95	3,562	
Lewis	8,533	28 71	244,033	1,378	36 68	50,165	52	43 06	2,245	
Lincoln	6,258	41 57	260,190	1,166	56 46	65,860	15	96 00	1,440	
Linn	9,158	38 10	348,927	985	45 34	44,665	40	56 25	2,258	
Livingston	8,555	35 78	325,698	1,031	49 95	51,505	44	59 90	2,636	
McDonald	2,943	40 67	119,718	827	53 28	44,019	15	45 93	689	
Macon	10,645	44 00	468,559	2,505	44 88	111,176	113	47 00	5,283	
Madison	2,079	38 64	80,333	775	44 00	33,993	38	60 00	1,974	
Maries	2,515	34 10	85,778	1,449	49 48	71,550	37	40 40	1,495	
Marion	6,818	39 64	270,078	1,413	47 76	67,486	34	74 56	2,535	
Mercer	7,305	35 50	260,445	498	39 83	19,835	29	30 00	850	
Miller	8,743	38 00	141,628	1,218	43 80	53,353	34	33 44	1,137	
Mississippi	1,466	38 59	56,580	1,788	50 30	89,940	17	25 60	435	
Moniteau	5,690	35 27	200,700	1,875	41 76	78,315	49	54 00	2,640	
Monroe	9,313	34 25	319,025	2,822	34 40	97,065	90	73 05	6,575	
Montgomery	5,758	37 00	212,866	1,583	43 34	68,619	58	53 00	3,060	
Morgan	4,019	40 40	162,360	1,372	60 00	81,410	56	42 14	2,360	
New Madrid	1,479	38 80	56,644	1,220	46 15	56,312	27	33 50	905	
Newton	6,422	37 95	243,932	1,318	51 59	67,740	33	31 17	1,050	
Nodaway	16,741	36 21	606,263	2,466	45 00	110,416	82	52 00	4,261	
Oregon	1,878	37 46	71,826	711	45 15	32,105	16	34 20	547	
Osage	2,580	37 85	96,335	2,698	49 49	133,535	32	45 50	1,455	
Ozark	1,753	38 88	68,080	451	48 46	21,855	20	36 25	725	
Pemiscot	1,179	41 32	48,718	505	54 00	27,252	10	45 50	455	
Perry	3,758	37 06	139,075	1,741	46 15	78,637	19	46 58	845	
Pettis	9,654	36 25	349,980	3,279	45 61	149,660	65	66 70	4,225	
Phelps	3,477	31 24	110,626	1,025	42 97	44,047	47	31 00	1,460	
Pike	8,215	42 63	350,250	2,514	63 60	160,060	93	83 00	7,710	
Platte	6,809	35 50	241,570	2,516	49 57	123,720	49	50 00	2,485	

ABSTRACT OF ASSESSMENT RETURNS.—CONTINUED.

LIVE STOCK.

COUNTIES.	MULES.			MULES.			ASSES AND JENNETS.		
	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.
Polk	7,139	$40 00	$285,272	2,117	$45 10	$96,472	61	$34 84	$2,059
Pulaski	2,424	38 00	90,835	555	47 43	26 325	22	15 22	335
Putnam	7,149	31 17	222,963	839	34 12	28,620	30	21 00	635
Ralls	6,100	38 79	236,765	1,768	57 00	98,350	.....	.....	.....
Randolph	6,764	41 38	269,885	1,970	42 38	83,505	33	106 06	3,500
Ray	9,286	40 72	378,445	3,218	53 88	173,405	49	78 87	3,595
Reynolds	1,577	46 13	72,756	825	63 41	52,314	25	25 20	630
Ripley	1,320	36 00	47,518	725	41 78	30,289	19	26 31	500
St Charles	4,986	47 29	235,785	3,136	60 14	188,915	8	52 50	420
St. Clair	7,913	39 80	311,042	1,250	48 45	60,571	52	48 84	2,539
St. Francois	2,749	35 67	98,064	1,146	39 90	45,725	39	44 10	1,720
Ste. Genevieve	2,741	35 66	977,77	883	39 35	32,779	16	37 62	602
St. Louis	15,934	61 61	981,683	3,220	64 40	207,359	.....	.....	.....
St. Louis city	6,661	45 05	300,102	3,756	55 08	206,822	.....	.....	.....
Saline	11,095	41 09	455,846	5,336	53 06	287,2 3	162	52 34	8,480
Schuyler	4,779	34 60	165,384	307	40 80	12,520	10	46 00	460
Scotland	7,535	34 63	260,940	854	43 48	37,135	50	36 90	1,845
Scott	1,956	44 30	86,640	17 41	52 57	91,361	13	43 30	606
Shannon	1,141	34 98	39,915	212	40 00	8,430	10	19 00	190
Shelby	8,224	39 40	324,102	1,538	45 87	70,550	69	63 55	4,385
Stoddard	3,158	34 56	109,131	1,396	40 00	55,358	32	31 50	1,007
Stone	1,753	43 80	76,795	403	50 85	21,495	19	39 74	755
Sullivan	8,764	39 67	347,655	1,168	52 60	61,434	29	52 02	1,510
Taney	2,255	35 08	79,121	447	40 50	18,099	27	24 44	660

Texas	3,658	35 41	130,580	982	39 61	38,915	61	24 25	1,480
Vernon	10,895	35 27	384,297	2,515	46 31	116,478	94	60 00	3,625
Warren	2,850	37 62	107,235	1,658	47 00	77,615	9	50 00	450
Washington	2,694	35 62	95,980	1,131	40 91	46,275	25	24 00	585
Wayne	2,327	37 48	87,230	814	47 92	39,010	27	34 00	915
Webster	4,280	48 00	202,142	1,678	53 00	88,752	39	62 05	2,420
Worth	5,007	38 50	193,217	879	52 18	19,776	46	40 00	1,845
Wright	8,858	44 80	172,830	927	51 00	47,818	46	45 00	2,060
Totals	697,294	.....	$27,090,482	194,359	.....	$9,582,644	4,660	.....	$244,125

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

LIVE STOCK.

COUNTIES.	NEAT CATTLE.			SHEEP.			HOGS.		
	Number.	Avr'g value.	Valuation.	Number.	Avr'g value.	Valuation.	Number.	Avr'g value.	Valuation.
Adair	19,860	$10 34	$267,240	13,699	$1 01	$13,870	16,111	$2 31	$37,260
Andrew	24,828	13 34	341,205	13,224	1 27	16,845	52,053	2 81	146,660
Atchison	25,138	14 23	357,798	8,501	1 02	8,590	47,758	2 99	142,635
Audrain	25,535	13 33	340,400	15,021	1 14	17,250	22,294	2 17	48,365
Barry	12,769	11 87	151,580	11,411	1 05	11,972	27,172	1 89	51,359
Barton	27,028	9 27	250,566	11,752	1 01	11,932	20,052	1 90	38,218
Bates	29,597	15 07	464,280	11,876	2 09	28,877	36,528	2 62	95,998
Benton	24,119	11 75	283,590	16,024	1 03	16,595	23,193	2 27	52,695
Bollinger	8,956	9 64	86,390	12,272	1 23	15,155	21,744	2 21	48,045
Boone	16,500	15 75	259,820	14,424	1 96	28,185	27,168	2 22	60,515
Buchanan	18,645	21 21	395,545	6,739	1 69	11,415	33,257	3 79	126,210
Butler	6,497	8 31	54,006	1,330	96	1,277	11,809	1 15	13,636
Caldwell	28,114	19 33	543,440	34,893	1 39	48,648	37,297	3 85	143,015
Callaway	18,639	16 92	317,430	40,194	1 40	56,645	29,192	2 53	73,865
Camden	9,892	10 42	103,094	6,771	1 01	6,892	18,769	1 43	19,634
Cape Girardeau	10,605	7 98	84,720	18,767	1 09	20,460	26,932	1 48	40,275
Carroll	32,359	13 69	443,227	15,394	1 16	17,896	54,439	3 01	163,901
Carter	2,248	11 55	25,976	1,102	1 26	1,398	4,455	2 28	10,197
Cass	25,668	13 53	347,492	12,269	1 13	13,863	42,644	2 51	107,068
Cedar	20,536	11 64	239,186	17,289	1 00	17,289	22,769	1 33	30,295
Chariton	30,799	12 83	395,413	15,553	1 10	17,187	41,312	1 64	67,997
Christian	7,715	10 29	79,450	8,039	1 15	9,267	19,130	1 09	20,953
Clark	19,029	11 59	220,605	17,377	1 56	21,935	13,416	2 22	29,885
Clay	19,016	18 52	352,339	16,916	1 24	21,081	33,519	2 17	72,694
Clinton	27,170	17 12	465,299	20,461	1 43	29,167	44,591	2 35	104,997

Cole	6,716	12 20	81,920	9,415	1 08	10,212	18,958	1 50	20,793
Cooper	16,070	18 22	292,678	29,780	1 40	41,780	32,804	2 64	86,660
Crawford	11,044	8 50	93,927	7,289	1 00	7,289	17,952	1 08	19,414
Dade	21,809	11 44	250,693	17,965	1 12	18,281	24,863	2 76	51,606
Dallas	10,998	8 29	91,229	15,738	1 00	15,731	16,573	1 77	29,326
Daviess	31,252	14 31	448,279	31,513	1 05	33,195	41,472	2 07	85,794
DeKalb	21,414	15 16	324,735	8,710	1 24	10,773	27,188	3 13	85,136
Dent	8,180	7 82	64,962	6,166	1 00	9,199	14,583	1 17	17,208
Douglas	6,755	10 25	69,278	6,933	1 30	9,033	16,418	1 15	19,076
Dunklin	9,895	7 76	76,880	1,831	1 00	1,863	20,603	1 61	33,006
Franklin	15,549	11 04	171,755	11,535	1 22	14,165	31,585	1 90	60,240
Gasconade	8,966	9 01	80,890	9,328	86	8,993	15,301	1 05	16,168
Gentry	28,756	12 08	347,545	25,112	96	24,115	30,883	2 29	67,940
Greene	14,883	13 27	197,624	24,067	1 11	26,715	32,458	1 92	62,569
Grundy	20,914	14 62	305,861	29,852	1 39	38,405	19,006	2 23	42,548
Harrison	43,625	12 68	553,495	46,618	1 06	40,718	32,743	2 10	68,752
Henry	28,100	14 63	411,075	9,722	1 43	14,017	37,154	2 89	107,398
Hickory	19,117	11 42	218,471	11,291	1 02	11,563	14,776	1 97	29,166
Holt	14,708	17 18	252,720	2,854	1 14	3,260	39,466	3 15	124,406
Howard	14,718	17 55	258,400	18,951	1 43	27,074	26,256	2 20	57,740
Howell	9,418	8 73	81,996	5,859	1 02	5,982	21,667	1 31	28,488
Iron	4,114	11 14	45,845	2,884	1 19	3,435	5,876	1 91	11,226
Jackson	25,143	18 00	452,375	16,746	2 12	35,535	42,117	3 25	137,087
Jasper	20,281	12 39	260,688	13,520	1 10	15,080	27,205	2 56	69,777
Jefferson	10,601	11 16	123,648	9,049	1 17	10,022	19,306	1 94	37,633
Johnson	25,955	14 10	365,895	15,886	1 09	17,335	46,129	3 25	150,075
Knox	23,668	14 67	346,500	21,071	1 01	21,402	20,157	2 43	48,722
Laclede	18,712	11 22	153,935	10,883	1 04	11,285	18,902	1 57	31,653
Lafayette	24,825	14,83	367,939	10,222	1 12	20,545	45,215	3 06	135,935
Lawrence	18,015	11 55	208,139	15,504	1 19	18,475	27,756	1 87	50,165
Lewis	23,649	12 64	298,795	20,682	1 27	26,460	24,055	2 33	56,120
Lincoln	13,647	13 68	186,740	14,257	1 20	17,170	21,377	2 29	49,000
Linn	27,579	10 93	501,245	26,311	1 02	26,881	24,470	3 04	74,350
Livingston	25,082	14 83	372,136	22,140	1 17	25,902	30,919	2 47	76,862

ABSTRACT OF ASSESSMENT RETURNS—CONTINUED.

LIVE STOCK.

COUNTIES.	NEAT CATTLE.			SHEEP.			HOGS.		
	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.	Number.	Av'r'g value.	Valuation.
McDonald	6,522	$10 08	$65,429	8,138	$1 23	$10,033	17,719	$1 47	$26,053
Macon	32,207	14 48	466,155	24,123	1 05	24,243	34,280	2 34	80,273
Madison	5,940	8 81	52,337	4,959	1 03	5,055	10,111	1 77	17,950
Maries	10,198	9 10	92,782	7,809	1 00	7,809	15,455	1 00	15,455
Marion	13,700	18 25	250,193	13,185	1 67	22,041	18,304	3 26	59,835
Mercer	25,764	13 15	338,991	26,404	1 05	27,955	19,650	2 05	40,412
Miller	9,771	11 14	108,852	12,137	1 02	12,399	17,896	1 50	27,263
Mississippi	5,358	7 55	40,484	429	1 10	475	6,738	1 60	10,817
Moniteau	13,381	10 44	139,730	16,099	1 50	24,120	23,637	2 43	58,605
Monroe	19,962	14 90	197,920	25,474	1 04	26,512	26,457	2 45	64,845
Montgomery	12,582	12 48	157,033	13,838	1 01	13,564	18,247	2 56	46,814
Morgan	11,628	16 30	189,380	14,591	1 95	15,345	15,728	1 90	29,749
New Madrid	5,492	7 97	43,821	963	1 21	1,107	10,008	1 87	18,755
Newton	12,486	12 92	161,357	10,800	1 02	11,052	19,663	2 32	45,799
Nodaway	54,642	12 20	665,803	17,960	1 00	17,853	85,090	2 45	208,525
Oregon	5,078	9 65	49,352	3,409	1 00	3,409	13,271	1 87	24,883
Osage	9,145	11 20	101,725	10,244	1 01	10,395	17,654	1 78	31,477
Ozark	5,069	9 73	49,354	3,360	1 00	3,861	12,513	1 50	18,757
Pemiscot	4,443	8 02	35,705	334	1 54	518	6,886	2 40	16,444
Perry	7,878	9 42	74,213	10,916	1 18	12,388	21,876	1 75	38,445
Pettis	25,451	17 60	448,050	28,345	1 45	41,360	27,083	3 00	81,260
Phelps	9,397	10 18	95,207	8,595	1 00	8,656	15,910	1 40	22,274
Pike	18,497	18 83	350,500	21,200	1 50	32,500	22,014	2 45	54,010
Platte	14,995	13 11	196,585	8,286	1 33	10,995	34,449	2 35	81,085

Polk	18,622	11 07	206,159	26,307	1 03	26,898	27,906	1 34	37,898
Pulaski	8,547	11 64	99,500	6,705	1 00	6,705	13,674	1 75	23,920
Putnam	26,483	12 43	329,326	19,220	98	18,963	17,338	1 81	31,880
Ralls	16,699	16 44	284,605	16,475	1 03	17,065	17,889	3 15	59,705
Randolph	10,366	17 74	184,040	18,609	1 31	24,466	17,648	2 24	39,705
Ray	27,399	17 16	470,516	13,105	1 51	19,885	51,050	2 80	144,127
Reynolds	5,196	11 48	59 683	3,023	1 11	3,364	10,598	1 95	20,232
Ripley	5,955	8 41	50,088	3,752	1 00	3,753	9,394	1 40	13,090
St. Charles	9,394	16 02	155.385	5,625	1 87	7,695	23,032	2 77	62,360
St. Clair	28,628	13 54	387,887	17,752	1 28	22,821	15,041	4 22	63,525
St. Francois	6,796	10 10	68,654	8,265	1 02	8,410	10,468	1 40	14,737
Ste. Genevieve	5,433	10 17	56,931	4,015	1 00	4,015	11,393	1 85	14,772
St Louis	8,285	.....	175,831	131	.....	581	2,170	.....	10,771
St. Louis City	8,832	19 63	173,419	4,414	1 91	8,436	19,015	3 63	69,076
Saline	27,430	16 72	458,709	17,846	1 54	27,556	47,685	4 03	192,020
Schuyler	12,734	12 66	161,260	23,512	1 00	23,512	10,857	2 75	29,912
Scotland	20,571	10 32	265,331	19,901	1 10	22,000	19,103	2 05	39,284
Scott	7,095	8 85	62,809	1,468	1 04	1,521	18,613	1 60	29,788
Shannon	2,933	10 17	29,857	2,902	1 00	2,902	7,929	1 52	12 031
Shelby	20,432	16 89	346,244	24,300	1 12	28,216	23,884	3 14	76,158
Stoddard	10,341	6 65	68,817	8,758	1 01	8,800	26,592	1 03	27,499
Stone	6,269	11 95	74,939	4,719	1 21	5,749	9,758	1 80	17,600
Sullivan	35,472	15 52	551,798	25,060	1 12	29,276	22,368	2 57	59,891
Taney	8,494	9 22	78,042	2,815	1 16	3,262	10,403	1 61	16,812
Texas	9,991	10 75	93,665	10,287	1 02	10,470	19,900	1 04	20,759
Vernon	40,935	16 08	658,521	13,934	1 08	14,404	31,060	2 76	85,682
Warren	9,407	9 00	84,660	7,248	1 01	7,315	17,337	1 92	33,325
Washington	7,611	12 26	93,340	6,905	1 02	7,035	13,588	1 31	18,800
Wayne	6,051	11 16	67,650	4,163	1 06	4,415	12,141	1 64	19,915
Webster	9,860	10 04	99,049	19,022	1 24	23,679	21,376	1 54	32,871
Worth	14,892	14 80	220,246	7,921	1 34	10,622	15,282	2 60	39,661
Wright	8,842	10 84	95,914	14,166	1 26	17,851	19,859	1,56	31,082
Total	1,946,025	.....	$25,910,468	1,542,444	.....	$1,842,116	2,708.682	.....	$6,296,232

AGGREGATE ASSESSMENT OF 1883.

39,092,549	acres of land	$244,262,931	
383,035	town lots	248,570,669	
			$492,833,600
696,816	horses	$27,090,642	
194,359	mules	9,582,644	
4,660	asses and jennets	244,123	
1,895,985	neat cattle	25,911,753	
1,542,444	sheep	1,842,116	
2,708,682	hogs	6,296,232	
13,972	other live stock	190,921	
	Money, notes and bonds	58,789,192	
	Broker and exchange dealers	2,288,115	
	Corporate companies	12,855,110	
	All other personal property	42,248,663	$187,339,511
	Total		$680,178,111

SUPPLEMENTAL RETURN OF CALLAWAY COUNTY NOT INCLUDED IN ABOVE.

19	horses	$765
15	neat cattle	255
70	sheep	120
16	hogs	65
	Money, bonds and notes	11,825
	Corporate companies	1,757
	All other personal property	5,525
	Total	$20,312

CROP REPORTS.

The secretary very much regrets his inability to give full and reliable statistics of crops for the various counties of the State. While the almost entire lack of funds has seriously curtailed the work of the Board, yet this inability to organize crop statistics grows out of the fact that the work was first organized for this year with correspondents relied upon, whom it was found, failed to answer. (We have many able and generous corespondents, but not enough for every county. It takes time to ascertain those upon whom we can rely), but the main trouble arises through the imperfection of our laws, or rather because our laws, unlike those of other States, do not require assessors to gather crop and acreage statistics. The present law should be so amended as to require assessors to return certain statistics to the Board of Agriculture annually, thus affording an official basis upon which to act As we could neither gather these desired facts from the State nor from the United States Department of Agriculture, to which the secretary applied, and as correspondents guessing at the average acreage would be mischievous the secretary cannot attempt to give a table of acreage so desirable by counties.

A table, imperfect of necessity, yet of some interest to many, of the correspondent's reports and estimates of crop yields will be given. While such a table will not show the counties where we may look for the best crops in largest amounts, yet the estimated yields will afford some indication of the successful crop of definite localities. It is fully expected to complete the machinery for full and successful gathering of crop statistics in 1885.

The bulletins of crop reports are printed, as they contain answers to a few general questions of much economic interest, and afford a summary of the crop returns for each period.

The secretary, in behalf of the Board of Agriculture, takes great pleasure in extending to those correspondents who have aided us with

their gratuitous services sincere thanks. It is hoped that they will continue to aid us for the coming year, when nearly 1,000 names will be on our list of contributors.

The footings in the table will not agree with the monthly statement exactly as fuller returns after publication modified first results, slightly. A few of our correspondents have evidently over estimated the crops. This will, in a measure, be obviated in the future.

CROP REPORTS.

COUNTIES.	Wheat, yield per acre...	Wheat, quality.....	Corn, yield per acre.....	Corn, acreage.....	Corn, quality	Oats, acreage.....	Oats, yield per acre.....	Rye, yield per acre.....	Hay, proportion of land in hay grasses.....	Hay, yield in tons per acre.....	Hay, price per ton.....	Flax, acreage.....	Flax, yield per acre.....
Adair	15	100	81.5	117	90	110	26.5	10	.....	1.75	$4 66	.....	
Andrew	18	110	40	105	100	93.3	32.5	18	22.5	2.50	5 75	.....	
Atchison	16.5	100	50	98.3	107	80	25	13	17.5	1 83	4 83	50	8
Audrain	14.7	86.6	34	103	102	98.3	31	10	35	1.41	5 00	100	7
Barry	11	102	26.6	105	90	107.5	27	.....	9	1.66	9 50	.....	10
Barton	15	100	40	100	85	100	30	.....	2	2.25	3 75	75	8
Bates	19	100	42	.....	101	100	32	.....	15	1.37	5 66	100	6
Benton	15	103	40	108	95	96.6	30	.....	20	1.83	8 00	75	10
Bollinger	12	100	26 5	100	95	95	27	.....	30	1	10 00	.....	
Boone	13	90	35	100	90	90	30	.....	.....	2	7 00	.....	
Buchanan	.....	.....	.....	100	.....	100	.....	.....	.....	.....	10 50	90	
Butler	12	100	39	.....	111	.....	35	9	25	2	15 00	.....	
Caldwell	20	.....	30	125	75	125	27	25	50	1.62	5 50	.....	
Callaway	18.5	97.5	35	.....	90	.....	27	.....	25	1	10 00	.....	
Cape Girardeau	13.3	105	30	100	97	96.2	30	.....	40	1 75	10 50	.....	
Carroll	17.5	92.5	.....	75	.....	100	.....	.....	10	2	8 00	.....	
Carter	7.5	95	.....	106	.....	108	40	.....	5	2	11 30	.....	
Cass	.....	.....	.....	90	.....	75	.....	.....	.....	.....	10 00	.....	
Cedar	.....	.....	.....	110	.....	93.6	.....	.....	.....	.....	7 33	110	
Charlton	15	100	41.5	112	90	125	30	.....	50	1.75	.....	.....	
Christian	13.5	100	32	105	98	100	37	.....	10	1.50	.....	.....	
Clark	.....	.....	35	90	90	97.5	45	18	.....	.....	.....	.....	

CROP REPORTS.—CONTINUED.

COUNTIES.	Wheat, yield per acre	Wheat, quality	Corn, yield per acre	Corn, acreage	Corn, quality	Oats, acreage	Oats, yield per acre	Rye, yield per acre	Hay, proportion of land in hay grasses	Hay, yield in tons per acre	Hay, price per ton	Flax, acreage	Flax, yield per acre
Clay	15	110	35	100	100	100	40		20	2.25	$10 00		
Clinton	13.5	95	35	100	100	77.5	20		27.5	1.75	5 50		
Cole	18	100	42.5	95	95	90	28		33.6	2.66	9 00		
Cooper	17.5	97.5	41.6	107	93	80.5	80		10	1.75	7 00		
Crawford			25		100						10 00		
Dade	12	100	36.6	107	96	95	25	18	25	2.50	8 00	50	12
Dallas	14	100	38.5	103	102	93.3	30		10	2	6 00		
Daviess		100	50	100	100	80	35		10	1.50	5 33		
DeKalb	19	100	60	120	100	130			40	2	7 00		
Dent	12.5	110	31.6	85	94	90	30		10	2 50	9 00		
Douglass	12	100	33	120	100	90	40	8	12	2	11 66		
Dunklin	9	100	35	100	100	105	20		10	1.50	15 00	95	
Franklin	10	100	38.3	103	98	103.3	27.5	10	20	2	8 25		
Gasconade	20	110	34	92	100	87.5	50				18 00		
Gentry	16	96.6	40	115	105	112	34	20	15	1.75	5 00		
Greene	14	80	30	113	87	96.6	35		12.5	1.75	9 33		
Grundy	11.5	100	50		99		34		33.5	1.50	5 00		
Harrison	11	105	34	90	100	112	25	10	50	1.25	5 50		8
Henry	14.7	102.5	40	92	100	83.3	37		16.2	1.75	6 00	50	5.5
Hickory	14	100	33.3	110	92	103.8	22	15	15	1.62	6 25	90	7.8

Holt			50	100	120	75	25	15			10 00		
Howard	16	105	40	100	100	90	30		7.5	1.50			
Howell			32.5	100	86	100					13 66		
Iron	12.5	97.5	32.5	112	107	100	27.5		10	1.25	10 66		
Jackson			40	100	80	60					6 50	100	12
Jasper	12	95	27.5	100	65	100	17.5		5	1 75	4 25	100	
Jefferson	19	100	35	100	100	100	30		7 5	2	12 00		
Johnson	13	98.3	36.5	92	88	80	35		13	1.75	7 37	75	10
Knox	18.3	103	37.5	105	82	109	32	15	32.5	1.50	4 00	100	6
Laclede	11.3	97.5	40	110	100	110	33		22.5	1.62	6 25		
Lafayette	14	88.3	48.3	103	90	105	21		20 6	2.75	8 50		
Lawrence	13	100	29	105	92.5	110	32		10	1.50	8 33		
Lewis	18	100	35	108	200	120	25		25	1	5 00		
Lincoln	18.5	96.6	45	95	97.5	68	32		7.5	2 25	12 5	90	
Linn	15	92	37.5	95	102	95	34	8	33.3	1 50	4 33		
Livingston	18	100		100		100	35	15	33.3	1.50	7 00	95	
McDonald	20	100	35	100	90		30		30	1.25	16 00		
Macon	16	95	35	80	100	125	40	20		1.25	4 50	75	
Madison		105	35		100		30	10			11 00	85	
Maries	16	102.5	36	100	100	150	29		10	1.75	8 75		
Marion	19	82	35	97	100	110	37	24	30	1.87	7 50		
Mercer			40	102	100	105	15		40	1.50	4 66		
Miller	14	100	30	88	90	98.3	25		17.5	1.50	10 00		12
Mississippi			50		95								
Moniteau	17.5	102.5	34	100	75	75	27.5		10	1.75	8 50		6
Monroe	16	100	30.6	100	102	96.6	40			1	5 66		
Montgomery	18.2	95	30	100	100	100	29		50	1.62	5 50	65	
Morgan			30	95	90	98.5	30				7 82		
New Madrid	16	96.6	25	105	100	102	25		5.3	1.66	14 50		
Newton	13	106	23.5	111	70	110	32		90	1.66	8 33		
Nodaway	20	100				130	30	17	20	2	5 00		12
Oregon	16.2	100	30	110	98	100	35		15	1 33	14 00		
Osage	15	100	43	100	96.6	90	25		10	1.50	5 50		
Ozark	9	100	40.5	103	88	104	33		10	1.75	10 00		

CROP REPORTS.

COUNTIES.	Wheat, yield per acre...	Wheat, quality.....	Corn, yield per acre.....	Corn, acreage.....	Corn, quality.....	Oats, acreage.....	Oats, yield per acre.....	Rye, yield per acre.....	Hay, proportion of land in hay grasses.....	Hay, yield in tons per acre.....	Hay, price per ton.....	Flax, acreage.....	Flax, yield per acre.....
Pemiscot	10	100	45	120	105	75	.....	.....	5	1.50	.....	.....	
Perry	17.5	105	35	100	102	100	32.5	10	17.5	2.50	$12 50	.....	
Pettis	.....	.....	32.5	100	86.6	80	.....	.....	.....	.....	5 50	.....	
Phelps	15.2	100	35.6	208	103	95	30	12	20	1.25	10 00	.....	
Pike	12	97	41	95	95	88.3	30	.....	33.3	2.50	7 25	.....	
Platte	13.5	92.5	40	92	100	93.3	33	30	17.5	2.50	11 50	.....	
Polk	12	95	25	100	85	100	20	.....	20	.75	7 00	.....	
Pulaski	10.5	100	37.3	100	106.6	101.5	27	23	15	1.62	8 00	.....	
Putnam	20	110	40.5	110	106 6	116.6	25	.....	50	1.50	4 50	100	
Ralls	.....	.....	36	110	100	75	.....	.....	.....	.....	6 83	.....	
Randolph	17.5	95	35	102	90	100	37	10	50	.....	6 66	.....	
Ray	20	105	30	110	105	110	30	20	25	1.25	6 66	.....	
Reynolds	12	105	34	103	98	100	28	.....	25	2	11 50	.....	
Ripley	6.5	100	.....	112	.....	100	20	.....	15	1.25	13 50	.....	
St. Charles	17.5	90	40	102	90	80	40	.....	.....	2.25	9 66	.....	
St. Clair	5	92	32.5	100	80	76.6	30	.....	5.7	1 75	3 33	75	9
St. Francois	10	100	27.5	100	95	90	20	.....	20	1	9 00	.....	
Ste. Genevieve	15	100	40	105	100	65	38	8	40	1.50	11 33	.....	
St. Louis	20	95	40	.....	100	.....	.....	.....	.....	1.50	11 00	.....	
Saline	21	100	40	.....	105	100	45	12	20	3.50	8 00	.....	
Schuyler	14	100	40	110	100	100	35	.....	40	1.50	4 00	.....	
Scotland	14	95	35	90	100	105	42	.....	.....	1.50	4 50	88	

Scott	.....	.....	30	100	95	92	25	.....	.....	.....	13 25	100	
Shannon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8 00	.....	
Shelby	10	100	85	.....	115	108	30	12	35	1 66	5 00	.....	25
Stoddard	17.5	100	40	115	105	95	85	.....	25	2	10 00	.....	
Stone	8	100	.....	100	.....	100	30	.....	10	1.50	11 00	.....	
Sullivan	20	95	36.6	115	105	108.3	32	10	50	1 33	3 50	.....	
Taney	11.5	100	35	111	100	112 5	25	12	6.5	2	8 00	.....	
Texas	15	100	35	92	90	106.6	25	.....	13	1.66	9 33	.....	
Vernon	14.5	97.5	25	105	75	90	30	13	15	1.25	8 50	95	8
Warren	11	97.5	34	100	100	95	26.5	12	10	1.50	9 00	105	
Washington	12.5	95	26	96.5	92 5	101	25	13	12.5	1.50	10 00	.....	
Wayne	10	100	40	100	101	95	30	.....	8.3	1.75	12 38	.....	
Webster	15	98	37.5	100	100	90	32	.....	15	1 83	10 00	.....	
Worth	15.5	98	42.5	92	112	106.6	35	20	88	2	4 37	.....	
Wright	12	100	85	92	112	122.5	25	15	5	.....	9 00	.....	
Average	14.4	99	36.2	102	97.5	98 1	30.4	15.2	20.9	1 72	$8 27	85.9	9.56

COUNTIES.	Sorghum, acreage compared with 1883	Sorghum, yield per acre, gallons	Beans, acreage compared 1883	Beans, yield per acre	Potatoes, acreage compared 1883	Potatoes, yield per acre	Potatoes, quality	Sweet potatoes, acreage compared 1883	Sweet potatoes, yield per acre	Sweet potatoes, quality	Tobacco, acreag compared 1883	Tobacco, yield per acre	Broom corn, acreage compared 1883	Broom corn, yield per acre
Adair	100		75	30	103	80	97.5	100		100	200			
Andrew	100		100		105	100	100	100		100			100	
Atchison	110	150	102	10	107	125	110	100	75	75	100		100	
Audrain	110	90			100	77.5	100			100			92.5	600
Barry	92.5	95		20	100	168	100	100	100	100		700	110	600
Barton	75						100						100	
Bates	100				100	85	73			100			98	
Benton	83.3	90	75		87.5	87.5	100	85		105			105	
Bollinger	95		100		100	90	94	95			100	900		
Boone	100		100		105	100	100	95					75	
Buchanan	78				100			100						
Butler	110	107	100	10	106	76	100	90	90	100	100	100	102	
Caldwell	80	150				75	100			100				
Callaway	110	100			100	125	100	110		120				
Cape Girardeau	86.2	145	100		107.5	70	96.6	92.5	150	100				
Carroll	80				100			100			100	600		
Carter	106		100	30	112			75			95		105	
Cass														
Cedar	100													
Chariton	102.5		110		110	100	87.5	110	125			1,000		
Christian	87.5	90	85	22 5	97.5	90	100	92.5	60	90	85	800	100	
Clark						100	100			100				
Clay	75			8	110	175	100	100						
Clinton	100				100	100	100	100					100	
Cole						100	100	100				1,000		
Cooper	85	90			100	105	102	100	125	100		800	75	

Crawford						100	100					850		
Dade	87.5	90	90	16	110	102	90	90	90	100	100	900	80	
Dallas	74.8	110	80	80	102	90	97.5	97.5	100	105		800		
Davies	125				125	250	100							
DeKalb	110	70			100	250	100	100		60				
Dent	92.5	150	110		100	145	96.6	90			100	600	100	
Douglas	75	125	100		105	125	90			100	100	1,200		
Dunklin		100			105	75	100	100	175	90	95			
Franklin	100	75	100		105	115	95	90	50	100	105	1,000		1,500
Gasconade	100				75	57.5	100							
Gentry	107.5	80	100	30	102	125	105							
Greene	95		100		90	122.8	100	100		100				
Grundy	75	50			100	125	97.5	100						
Harrison	100					75	105					600	141	600
Henry	50					100	100						100	400
Hickory	90	100	100	30	108	60	96.6	95		100	90			
Holt	105				150	100	100	100			100	1,000		
Howard	85				105	150	100		200	100	130	800		
Howell	100	125				150	90		200	100		900		
Iron	92.5	80	100	5	103	120	95	100	175	100	100			
Jackson	75				100	75	90	75		75			80	
Jasper	75				60	25	50	100	150	100				500
Jefferson					114			97.5		100				
Johnson	80	100				180	105	75	200	100				500
Knox	103	125	100	10	100	100	100	100	75	95	100	900		800
Laclede				20	100	60	100		40	000	100			
Lafayette	100	120			100	138	92							400
Lawrence	110	150	100		75	95	95	80	90	90				
Lewis					110		110	100		100				
Lincoln	93.8				100		102	80		130	90			
Linn	90		90		100	162	100				110	1,225		
Livingston	80												100	
McDonald	85					60	90	90						

CROP REPORTS—CONTINUED.

COUNTIES.	Sorghum, acreage compared with 1883	Sorghum syrup, yield gals. per acre	Beans, acreage compared 1883	Beans, yield per acre	Potatoes, acreage compared 1883	Potatoes, yield per acre	Potatoes, quality	Sweet potatoes, acreage compared 1883	Sweet potatoes, yield per acre	Sweet potatoes, quality	Tobacco, acreage compared 1883	Tobacco, yield per acre	Broom corn, acreage compared 1883	Broom corn, yield per acre
Macon	100		75		125	100	100	100			125	1,500		
Madison	100	50	100	5	100	48		100	35		100	1,000		
Maries	93.8			22.5		165	100	100						
Marion	1 0		100		100	90	90	100	80	100	100	1,000		
Mercer	105					87.5	100							
Miller	105	60	60	8	20	120	85	65	75	108	100	300		
Mississippi		80				100	100		75	100				
Moniteau	96.6				100	112	98.3	100		100		800	100	
Monroe	110	80	100		100	125	103	100	100	100	125	966		
Montgomery	100		100		100	200	100	100			100	550		
Morgan	75					100	100							3,000
New Madrid	85		100		110	150	100	100			100			
Newton	96		80		80	45	96	100			85			
Nodaway	85		120	20	113			113					100	
Oregon		100				50	100		20	100				
Osage	100	120				125	102			110		1,000		
Ozark	105	120	100	30	100	87.5	100	75	100	110	110			
Pemiscot	100				100	250	100	100			100			1,900
Perry	92.5	90	10	10	100	50	100	100	80	95	100			
Pettis		80				70	95.6	100		95				
Phelps	100	100				75	100			100		800		
Pike		45			95	112	100	100	175	100	100	1,150	90	
Platte						60	100							
Polk		50		10		40	110							
Pulaski	105					92.5	100					2,000		
Putnam	112	150	100		120	250	95						100	800

Ralls	75	110	.....	.....	95	100	100	.....	.....	105	.....	800	.....	.....
Randolph	92.5	1 0	100	.....	100	2 0	100	100	.....	.....	129	1,100	.....	.....
Ray	100	120	.....	.....	70	60	80	.....	.....	.....	60	1,000	.....	.....
Reynolds	96.6	60	100	15	100	105	10.)	100	.....	.....	.....	.....	.....	.....
Ripley	.....	100	.....	.....	.....	100	100	.....	125	100	.....	900	.....	.....
St. Charles	.....	.....	.....	.....	200	100	.....	.....	150	100	.....	.....	100	.....
St. Clair	97.5	100	100	.....	100	150	92.5	100	150	100	50	1,000	40	.....
St. Francois	.....	.....	100	.....	107.5	60	87.5	100	.....	.....	.....	.....	.....	.....
Ste Genevieve	.....	.....	.....	.....	.....	100	110	.....	.....	.....	.....	.....	40	.....
St. Louis	.....	.....	.....	.....	90	100	90	100	.....	.....	.....	.....	.....	.....
Saline	.....	.....	.....	.....	110	200	.....	90	.....	.....	.....	.....	.....	.....
Schuyler	.....	85	.....	.....	.....	86.6	86 6	.....	102	100	.....	1,250	.....	.....
Scotland	100	100	.....	.....	.....	100	80	.....	200	100	.....	1,009	.....	.....
Scott	88	130	100	.....	80	125	105	100	.....	.....	100	.....	100	.....
Shannon	120	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shelby	113	70	70	3r	115	120	100	95	115	125	162	900	93.3	3,000
Stoddard	96.6	140	90	.....	110	100	105	100	75	100	100	800	.....	.....
Stone	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sullivan	107	80	92.5	.....	102.5	116	93.8	97.5	150	105	110	1,000	.....	.....
Taney	98	100	100	24	100	150	100	90	200	100	125	650	.....	.....
Texas	93.3	.....	100	.....	100	.....	100	100	.....	.....	100	.....	.....	.....
Vernon	80	150	90	.....	100	90	90	100	150	95	85	1,000	90	.....
Warren	85	.....	105	.....	102	57.5	100	100	.....	.....	110	925	.....	.....
Washington	90	40	100	15	100	100	102	90	50	100	85	.....	.....	.....
Wayne	92	.....	100	10	102	137	100	95	.....	.....	105	2,500	100	.....
Webster	87.5	150	85	.....	100	135	100	95	60	100	80	1,100	.....	.....
Worth	110	100	.....	.....	100	137	100	100	.....	.....	.....	.....	.....	.....
Wright	75	75	200	11.5	100	150	102	110	112	110	110	1,500	100	2,000
Average	94.3	100	97.7	18.2	106.8	110.6	97.5	95.9	113 3	99.9	103.1	978	94	1,185.7

COUNTY RESOURCES AND LAND VALUES.

The following reports of correspondents of county resources and land values are taken from the notes of reporters for the counties. As sometimes three or four give reports, I have selected the name of the correspondent giving the fullest or most satisfactory returns, and have added the remarks of others to his, or qualified his statement. Thus I have taken the average price of land named by those reporting for one county. While the information conveyed is not always as definite and full as we might desire, it is hoped that it may prove of some value to enquirers.

ADAIR COUNTY.

REPORTED BY NOAH STUKEY, MILLARD P. O.

Creameries pay from 14 to 16 cts. per gauge (that is 8 inches in diameter and 2 inches in depth, is called a gauge). Improved lands range in price from $15 to $35 per acre; there is but little land lying out that is good for cultivation; our county is best adapted for grass and stock.

ANDREW COUNTY.

REPORTED BY BERY PETREE, FELLMORE P. O.

Andrew county is situated in Northwest Missouri, in what is known as the Platte purchase, and is as fine a body of land as can be found any where in the United States, and has as many natural advantages as can be combined in the same area in any part of the world; good soil, good water, plenty of timber, good building stone, a good climate, and is especially adapted for farming and stock raising; fruits of most all kinds, adapted to this latitude, grow to perfection, apples in particular, about $250,000 worth of which was shipped from this county last year. This county was first settled in 1837. There is no unsettled land in the market; good farms can be bought at from $20 to $50 per

acre. The soil is practically inexhaustible, fields that have been cultivated for forty years, every thing taken off and nothing returned, have, by using clover, been brought back to their virgin firtility in two or three years.

ATCHISON COUNTY.

REPORTED BY W. J. MCMILLAN, BLANCHARD P. O., IOWA.

In regard to cows, the farmers here think it pays better to let the calves have the milk than it does to sell the butter; on an average, butter sells for about 10 cts. per pound during the year, which does not pay. There is no unsettled land in this county; land is worth from $30 to $50 per acre; the land is rolling, with plenty of springs and running water; and is a fine stock county. Farmers are sowing more grass every year; timothy and clover being the leading grasses sown. Farmers are making up their minds to farm less land and cultivate it better. Farmers are raising better stock, more thorough bred stock having been brought into the county in the last year than in the previous eight or ten years.

AUDRAIN COUNTY.

REPORTED BY S. S. HOPKINS, FULTON P. O.

Land is worth from $20 to $40 per acre and is nearly all enclosed. The soil is well adapted to corn, oats, all the grasses, clover, etc., and some localities good for wheat, which is only a sure crop on timbered lands. The county, as a whole, is probably best adapted to the raising and feeding of all kinds of stock. Fruit does well, but receives little attention. There are no creameries or cheese factories in this county, but it is especially adapted for such purposes. We have two railroads running through the length of the county, making the shipping facilities good, besides a good home market for our products.

CALDWELL COUNTY.

REPORTED BY POSTMASTER AT CATAWBA.

Corn is the staple crop, and the feeding of cattle and hogs for market is the leading business of the farmers. Not one-fourth of the cattle fatted are raised here, but the counties north of us furnish a large number for that purpose.

CALLAWAY COUNTY.

REPORTED BY J. L. IRWIN, FULTON P. O.

The price of land is from $15 to $40 per acre. Grass, wheat, corn, oats, tobacco and sorghum are the principal products of the soil; cattle, mules, horses, hogs and sheeps being the stock principally raised. Too much farm and too little manure, too many acres planted and not enough sown to clover, too much politics and too little stable room. Month of September I received the milk of one neighbor and run my own and his through D'Laval separator, 29,085 pounds of milk, and got 1,343 pounds of butter, or 21⅔ pounds of milk to one pound of butter; I made about 1,500 gallons sorgo syrup, using about 150 pounds of cane to one gallon of syrup; best I made was pure Amber.

CAPE GIRARDEAU COUNTY.

REPORTED BY D. L. CORWIN, MILLERSILLE P. O.

There is no government land in this county, to best of my knowledge. Unimproved land is about ten dollars per acre; improved twenty dollars upon average, but varies according to locality. I am not able to state, accurately, the proportion reliably, but would suppose over two-thirds. Corn, wheat, oats, and barley and rye may be grown successfully; the two latter but seldom sown. Timothy, red top, clover, millet or Hungarian, and in some localities blue and orchard grasses, grow successfully. Apples, peaches, pears, plums, cherries, and nearly all the sweet fruits common to the West, are successfully cultivated, but as a general rule ouly to a limited extent and indifferent manner.

CHARITON COUNTY.

REPORTED BY J. T. SWAIN, KEYTESVILLE P. O.

The best improved lands in this county rate at $35 to $40 per acre. Wild land from $3 to $20 per acre. The timbered sections are fine lands for tobacco, corn, wheat, oats, potatoes and fruits. The prairie land can't be beat for grass, meadow and grazing, and is good for corn, oats and other crops, but is not as well adapted to wheat, tobacco and fruit as the timbered lands.

CHRISTIAN COUNTY,

REPORTED BY W. J. WRAY, OZARK P. O.

The north half of Christian county is well adapted to general farming purposes. Land in this part of the county is worth from $5 to $30 per acre; there is some railroad lands yet in the market. The southern part of the county is very broken and rough, covered with timber and well adapted for stock raising and fruit growing. There is quite an amount of government land here yet to be taken up at almost nothing under the homestead laws; other lands can be had at from $2.50 to $5 per acre. We have quite an amount of mineral land in Christian county; good lead in paying quantities within two miles of Ozark, the county seat, and lead and zinc exist almost all over the southern part of the county with excellent water power, and timber without end.

CLARK COUNTY;

REPORTED BY HOSEA STOUT, WINCHESTER P. O.

The price of land in this county is from $10 to $60 per acre, owing to quality, improvements and location. Our up land is underlaid with a clay sub-soil, is productive of corn, oats and grasses of all kinds, potatoes and all kinds of root crops, and the timbered portion is good for wheat; our bottom or valley lands are of a black, sandy loam which produces abundantly of all kinds of crops. There are a great many farms for sale, land owned by speculators and non-residents. Cattle are very high, sucking calves range from $13 to $23 per head, other cattle in proportion; hogs from 4½ to 5 cents per pound.

CLAY COUNTY.

REPORTED BY H. H. WINSLOW, LIBERTY P. O.

The price of land in Clay county varies according to improvements, unimproved land being worth from $15 to $ 30 per acre; improved lands, in some cases, as high as $50 per acre. The uplands are very fine for all kinds of grasses and wheat; stock raising is quite largely followed, and I think in a few years, at least, it will be the principal industry of the county.

CLINTON COUNTY.

REPORTED BY W. L. CULVER, GRAYSON P. O.

Stock of all kinds in good condition; crops well secured and plentiful.

COLE COUNTY.

REPORTED BY JAS. MCWORKMAN.

The wheat crop of this county has been injured in stack on account of rains, in my judgment, at least 10 per cent. Corn on the stalk has also suffered from the same cause. There are no unsettled lands in this county. Our county is well adapted to stock raising, as blue-grass flourishes almost, if not quite as well, as in the best counties of Kentucky, but our county is settled largely by Germans, who do not recognize the value of grass. The same remarks apply to most of the native population. Cole county is well watered by the Osage river, Missouri river, the Moniteau creek, a large stream, as also is the Moreau, besides numerous small streams. If our people would quit plowing and turn their attention to grass and stock raising, farms would double in value in a few years; at present farms are selling very low, $10, $15, $20, and the best and highest price not being over $25 per acre, except close to Jefferson City.

COOPER COUNTY.

REPORTED BY D. F. NIXON, HARRISTON, P. O.

Cooper is an old county, consequently is all settled up. Wheat and corn are the main crops. Land is worth from $25 to $50 per acre, owing to soil, improvements, location, convenience to market, etc. There is not much lands changing hands and not much emigration to or from this county. People are generally in good circumstances and are willing to let good enough alone. Farmers generally are giving their attention to improved live stock, especially to cattle and horses. Among the profitable crops none have been as much neglected as clover; some are beginning to realize this fact, and are turning their attention in that direction.

CRAWFORD COUNTY.

REPORTED BY L. D. GROVER, CUBA P. O.

Land is worth from $1.25 to $20 per acre; we have some government and railroad land yet in the market. Our county is a rough, ridgy, timbered country, best adapted to fruit growing and stock raising. In my opinion, there is too much wheat and not enough grass and stock raised here.

DADE COUNTY.

REPORTED BY W. L. SCRUGGS, GREENFIELD P. O.

No public lands in our county fit for settlement. Improved land is selling all the way from ten to fifty dollars per acre. Our real estate agents are doing a good business selling unsettled land. Our county is about twenty-five miles square, composed of one-third timber land and balance prairie; soil good, well adapted to the growth of corn, wheat, fruit, etc. Our county, in point of thrift, progress and desirability for settlement is fully up to the average of the southwest Missouri counties.

DALLAS COUNTY.

REPORTED BY G. A. HOWESTON, LONG LANE P. O.

Improved land is worth from $8 to $25 per acre; unimproved land from $2.50 to $10 per acre No Government land that is good for anything; some railroad and Agricultural College lands that are good. The county has a railroad debt amounting to $250,000, otherwise it is in good conditon. Corn, wheat, oats, timothy, clover and tobacco grow well. Farming is not conducted as well as it might be. The acreage of grass should be increased. Some land has been cultivated for thirty years and not a load of mnnure put on the same.

DAVIESS COUNTY.

REPORTED BY A. F. HENDRICKS, BANCROFT P. O.

Our cattle, hogs and horses are free from any disease. The late rains have made our corn all one could ask—the best we have had since 1875. Fall pastures are growing fine.

DeKALB COUNTY.

REPORTED BY JOHN W. FAUCETT, MAYSVILLE P. O.

Wheat was never finer; fall pasture is fine—we could not ask for better; corn is sound and there is nothing working on it anywhere.

DENT COUNTY.

REPORTED BY B. A. HEDVICH, FALLEDGE P. O.

The price of land is from $2 to $15 per acre. There is a small portion of unsettled land in this county which is fit for cultivation—probably 5 per cent. This county is much diversified; about one-third is valley; the soil is a dark, sandy loam, and very rich, and is best adapted to growing corn; twenty per cent. is rolling land, covered with black oak timber, and is best adapted to the growing of small grains; twenty per cent. is table land, covered with post oak, a clay soil and is fit only for growing grasses; forty per cent. is composed of rocky ridges, too rough to plow, but furnishes good grazing for sheep.

DOUGLAS COUNTY.

REPORTED BY W. W. DAILY, BEAVER P. O.

We are turning our attention to the cultivation of tobacco. This is the best soil for fine tobacco that I have ever seen. We have cured tobacco this year which we have been offered sixty cents per pound for. This county is aiming at a large crop next year. The land of our county is priced by the improvements; none of it sells at its value as yet, but it is on the look up fast. A great many emigrants are coming here this fall. There is yet some Government land. Most of our farmers here farm on the old plan, which I think could be improved. This is a fine county for stock of any kind. Land sells at from $1.25 to $15 per acre

DUNKLIN COUNTY.

REPORTED BY J. J. KNIGHT, MALDIN P. O.

In answer to your inquiries I will say that there is considerable wild land in this county, owned by land speculators, which can be bought for from two to five dollars per acre. There is considerable improved land in this county that can be bought for from five to ten dollars per acre. Our land here is best adapted to corn, cotton, oats and wheat.

FRANKLIN COUNTY.

REPORTED BY S. R. BAKER, SULLIVAN P. O.

The price of wild land is from three to five dollars per acre. There is considerable railroad land, price. from $2.50 to $3 per acre; improved land, from $5 to $25 per acre. There is plenty of land in the county for sale. Timber is good. Lead and iron ore are found. Fruits of all kinds grow well, also all kinds of grain. This is considered a healthy county with good soil. Churches and schools are convenient, and two railroads pass through the county.

GENTRY COUNTY.

REPORTED BY H. CARR WILLIAMS, FORD P. O.

We have plenty of rain, scarcely too much. Fall grain is looking finely; splended fall pasture. No frost to do damage till 22d October. Improved land averages about $30 per acre. There is some wild land yet held at $15 to $20 per acre; good prarie, worth $20; brush lands, $12.50 to $15; extra good, higher. This county is well adapted to stock raising and general farming. What we need most is smaller farms and less renting.

GREENE COUNTY.

REPORTED BY J. F. BROOKS, REPUBLIC P. O.

Improved lands are worth from $30 to $65 per acre; unimproved lands from $8 to $10 per acre. The land is generally rolling with brush and light timber. Springs are quite plenty. Wheat raised here is of the best quality. The county will compare wiih any, and probably is the best in Southwest Missouri for all purposes. We need more diversity in farming. It is too much wheat and not enough of stock. More cattle, sheep and hogs, with factories and more intelligent management throughout, are needed.

GRUNDY COUNTY.

REPORTED BY GEO. H. HUBBELL, TRENTON P. O.

Lands are worth from $25 to $40 per acre, good roads, fine bridges and 80 odd school houses. The public school in Trenton is the best in

North Missouri, costing over $40,000, and has over 700 scholars. This is a cattle and sheep county; blue grass, clover and timothy abounds, while corn, oats and wheat are raised, yet the grass and cattle men make the money. Corn all safe and a large yield; wheat doing well; stock hogs scarce; but few cattle feeding, western buyers having purchased the most of the surplus cattle; hay damaged by rains.

HARRISON COUNTY.

REPORTED BY J. N. BRYANT, BETHANY P. O.

The hog crop will be light, yet it will be 20 per cent. larger than last year. The corn and potato crops are good. Potatoes are selling from 15 to 20 cents per bushel.

HENRY COUNTY.

REPORTED BY JAMES M. HOMER, MONTROSE, P. O.

Coal abounds in all of our lands in this part of the county. Land varies from $20 to $60 per acre. Our principal crops are wheat, oats and flax. All grains do well. Fruits thrive here. Wild grapes are now being changed for tame grapes.

HICKORY COUNTY.

REPORTED BY A. W. BROWNLEE, QUINCY, P. O.

Corn in shock is and has been badly damaged by wet weather. Corn mouldy and fodder blackened, and unfit for use. It will not yield as much per acre as was estimated two months ago. As to apples, not more than one half a crop, and rather inferior at that. Our wheat looks well, although sowed late. Owing to the wet weather, some are sowing now. Lands or improved farms sell from $10.00 to $20.00 and $25.00 per acre, according to quality and improvements. No government land that is worth anything for settlement, although lots of hills and gullies still remain in the hands of government.

HOLT COUNTY.

REPORTED BY WM. RANCHER, OREGON P. O.

There is considerable good fruit land still unimproved in this county, which can be had for $10 per acre. There are 4 railroads in the county,

viz· Kansas City, St. Joseph & Council Bluffs, s e to w, 31 miles; Nodaway Valley, center to n e, 20 miles; St. Joe & Nebraska, St. Joe and Denver, north center to w, 10 miles; Tarkio Valley, n, 2 miles. The county is well adapted to fruit culture, all kinds of vegetables, fruit (small,) wheat, corn, rye, oats, tobacco, hemp and many other crops. Barley does not do well. Also good for cattle, horses, mules, hogs and sheep. There is a good woolen factory at Oregon. A good opening for a mill at Forest City, where one will be sold in January.

HOWARD COUNTY.

BY H. L. BROWN, FAYETTE.

Wheat area is above 80 per cent.; it looks better than ever known; owing to heavy rains, sowing was delayed. We put corn in condition at 100, perhaps that is high; it is ripened sound and much above the average. Rains have injured it some, and should a hard freeze come, it would not escape injury.

HOWELL COUNTY.

REPORTED BY P. N. GULLY, HUTTON VALLEY, P. O.

The price of land in cultivation, $10 to $25 per acre. Plenty of unsettled land in this county. Character fair and is adapted to corn, wheat, oats, pototoes, and is well adopted for raising of all kinds of live stock. The mode of farming could be greatly improved, but is improving very fast in this respect.

IRON COUNTY.

REPORTED BY W. W. HEYWOOD, IRONTON, P. O.

There are a good many farms run down, and could be bought cheap and improved easily. Some wild land subject to entry, but too poor to cultivate. The county is hills and valleys; farms mostly in valleys, but there is good land on the hills, where bluegrass, a natural grass if grown on land free from brush. It is a natural range for sheep and very healthy for them. Wild land can be bought, after the timber is cut off by the mill men, for 30 cents to $1 per acre, and the above run out farms from $5 to $10 per acre, with passable buildings thereon, fit to live in for awhile, till better ones could be built. I know of no better place for a poor man to make a start with a few dollars to begin with. The public works at Iron Mountain, Pilot Knob and the two

Granite Quarries, now developed and being worked by hundreds of consumers, gives a home demand that always will be in excess of supply, and prices for farm products are equal to St. Louis, if not even better.

JACKSON COUNTY.

REPORTED BY S. C. RAGAN, HICKMAN, P. O.

We have in this county fine farms for sale at from $40 to $50 per acre and within 14 miles of Kansas City. Farms are cheaper here than in Lafayette, Bates, Johnson and Cass counties. We have a well watered county, producing wheat, oats, corn, rye, potatoes, and is likewise a fine grape growing county. We have fine schools, churches and consequently good society. No wild lands for sale.

JASPER COUNTY.

REPORTED BY ISAAC N. JOHNSON, JASPER, P. O.

The price of lands in my county is from $20 to $50 per acre, as to quality, location and improvements; no unimproved prairie land to speak of. This county is better adopted to raise fall wheat than any other grain; but all the grains and grasses do well in this county. I think the farmers have been sowing too much wheat and not enough grass. There is a good deal of good stock in this county, but not as much as ought to be. The low price of wheat for the last three years has caused the farmers to sow a good deal of grass and clover.

JEFFERSON COUNTY.

REPORTED BY W. S. JEWETT, CRYSTAL CITY, P. O.

Our county is generally rough-broken or upland; would be well adapted to wool growing but have too many person trying to eke out a living by coon hunting, and as a consequence too many worthless dogs; hardly a good flock of sheep in county, and what few there are are of the old common variety. Our farmers are generally trying to wear out their poor farms by putting then in wheat year after year, succeeding fairly; but think that as the price is now down, more are sowing crop and will raise more stock especially cows, as there appears a good demand for milk at our factories and for St. Louis market. A stock law would be of advantage, could the voters but see it.

JOHNSON COUNTY.

REPORTED BY J. A. DRUMMOND, WARRENSBURG, P. O.

We have had allmost constant wet weather here this fall, which has retarded the farmers from sowing wheat; consequently the crop is late put in, and is not making much of a sowing yet. The wet weather has damaged the corn crop about one fourth. Our lands are nearly all improved; the prices range from $15.00 to $75.00; some very good farms can be had for $30.00 per acre. Some of our lands are very well tilled; the majority are very poorly handled; would produce much better if properly cultivated.

KNOX COUNTY.

REPORTED BY JOHN D. MCFARLAND, EDINA, P. O.

Our county is 21 to 24 miles, mostly rich prairie land, with plenty of timber for fencing, and fine road. Most of our county is in cultivation. We raise wheat, corn, oats, and most anything we plant; but it is best adopted to grass; most of the farmers are putting their lands in timothy, clover or blue-grass. This is destined to be one of the finest dairy counties in Missouri. We have a fine roller mill in Edina, our county seat, which will encourage wheat growing; we have some fine wheat land. Land can be bought from $5 to $30 per acre. We have a cheese factory in southeast part of county.

LACLEDE COUNTY.

REPORTED BY ALFRED CARR, LEBANON, P. O.

There is some unsettled land in this county; it is best adopted to clover and grasses. The lands generally in the county are adopted to wheat, corn, oats, rye, timothy, clover and blue-grass; it is also good for all kinds of fruit, as well as for vegetables. The price of land ranges from $5 to $25 per acre, much depending on location and improvements.

LAFAYETTE COUNTY.

REPORTED BY WM. T. GORMAN, ODESSA P. O.

Good land is selling at $40 to $80 per acre. If you mean by unsettled land Government lands, there is none. Plenty of land on the market; have room for double our inhabitants; farms too large. The

character of our county is O. K.; well adapted to hemp, but there being little or no demand for it, do not plant any more; next best adapted to corn and the grasses, and pretty good for wheat, fine for apples and small fruits, etc. Error of farming—over-cropping and negligence, but improving gradually.

LAWRENCE COUNTY.

REPORTED BY J. L. WRIGHT, PIERCE CITY P. O.

Unsettled or unimproved land is worth all the way from $5 to $20 per acre, improved in proportion. The county has a variety of soils, some black, some mulatto, etc.; about half prairie and half timber; adapted to wheat, oats and corn, Irish potatoes, sweet potatoes, etc.; also timothy, millet, clover, etc. The best results are obtained by sowing wheat after wheat for a series of years in succession—the land seems to get richer with such treatment, even without being manured, but of course manure helps, too, and the majority of farmers use their wheat land that way.

LEWIS COUNTY.

REPORTED WITHOUT NAME.

One creamery called Lewistown Creamery, Thomas Humphrey, president, commenced last spring; did well; took premium at St. Louis fair this fall on butter; get the highest price for butter in New York, where they ship their butter mostly; capacity, 2400 pounds per day. Have run about 500 to 600 pounds during the summer.

LINCOLN COUNTY.

REPORTED BY H. B. SUDDARTT, FOLEY P. O.

In answer to seventeen, regarding creameries, it is almost impossible to give the pounds per cow, as milk is gathered from farmers in most cases. It is generally conceded to be a profitable business. This one is rather an experiment, but think it will prove successful; stock of all kinds is in fine condition. Pastures are most excellent. Taking all in all, our farmers are well prepared to take stock through the winter.

LINN COUNTY.

REPORTED BY JAMES C. STOLER, LINEUS P. O.

There is no vacant land in this county; little unimproved land selling from $8 to $15; improved farms from $15 to $50, owing to the

size, improvements and proximity to town. Our lands will produce almost every thing that any farming land will, but is chiefly devoted to grass.

LIVINGSTON COUNTY.

REPORTED BY J. H. JACOBS, CHILLICOTHE.

Our lands are worth from $15 to $35 per acre, according to location and improvements. We have a splendid soil, favorable for corn, wheat, oats, rye, flax, and especially favorable for clover, timothy and blue grass. Corn and grass are our greatest staple crop; although tobacco is largely cultivated in some portions of the county. Livingston county is now nearly out of debt. The collections of this winter will pay interest in full and the county debt. Our lands are all under improvement; school houses and churches all built, and our people are very thrifty and rapidly accumulating material wealth.

MADISON COUNTY.

REPORTED BY W. H. STALEY, FRACE CREEK P. O.

There is perhaps a few thousand acres of tillable land in this county that would produce all kinds of grains and vegetables that grow in this climate. The most of the land now in cultivation is second-rate, and is well adapted to wheat and timothy. The price of such lands range from $1 to $8 per acre. The most and best lands not in cultivation are owned by non residents.

MARIES COUNTY.

REPORTED BY LINDON MARTS, GROVEDALE P. O.

Corn, very good. Wheat sown under favorable circumstances. Land is cheap, ranging from 50 cents to $20 per acre; considerable unsettled land; character of the land, rolling, with good rich land in bottoms. The land is well adapted to the raising of everything that has been tried—wheat, corn, rye, oats, grasses of all kinds. All kinds of stock do well here. Stock raising is very profitaple. There is no system of farming here. Seven-eighths of the farmers go it blind, keep no accounts, haul out no manure, etc.

MARION COUNTY.

REPORTED BY J. R. DUDLEY, WITHERS MILL P. O.

The price of land in our county varies very widely, ranging, I will say, from $20 to $80 per acre, according to quality, location and improvements. The land also varies much in quality, being about equally divided between prairie and timber, and is well watered by running streams and branches. The timbered land is rich and productive, and is adapted to the growth of hemp, corn, wheat, tobacco, grass, fruit, vegetables and all kinds of farm products of this latitude. The prairie, while not so well adapted to grain growing as the timbered land, being too level for a wet season, is most admirably adapted to growing grapes, oats, and to grazing purposes, and is not valued so high as the timbered land.

McDONALD COUNTY.

REPORTED BY J. P. LAMANN, PINEVILLE P. O.

Every even section land belongs to the Government; many homesteads taken and plenty left; land not so good generally as the lowlands. We are bountifully supplied with good springs and running water. Good grazing for all kinds of stock, particularly sheep. Farming here is not carried on very extensively though we have very fine lands on the rivers, creeks and tributaries.

MERCER COUNTY.

REPORTED BY ———— PLEASANTON, IOWA P. O.

Mercer county has fully as much timber as prairie land. The timber land is broken; prairie roling; the former is better adapted to grazing than grain growing. Blue grass is a natural production; timothy and clover do well. Improved land rates from $10 to $25 per acre. Do not know of any unsettled land in market. Want of rotation of crops appears to be the greatest error in farming in this county; corn following corn for a number of years. The best farmers are getting out of the ruts and raising more grass.

MILLER COUNTY.

REPORTED BY J. L. SHEPHERD, ELDER P. O.

This county is best adapted to stock raising; comparatively a small portion of the land is under cultivation. Land is worth from $2 to $25 per acre, owing to location and improvements. We need a creamery and a fruit canning establishment; a large portion of the county is strictly adapted to fruit, and the fine springs would make it a good location for a creamery.

MISSISSIPPI COUNTY.

REPORTED BY A. H. DANFORTH, CHARLESTON P. O.

Our crop of wheat will not be as large as last year, as our farmers say they cannot raise wheat at the present prices; our crop of corn is good and will be a good quality, farmers now gathering and cribbing same. We will not have hogs for our own use this season. Dry weather hurt the yield of corn probably 5 per cent., and hurt the turnip crop badly. We have had no late potatoes on account of dry weather for the last two months.

MONITEAU COUNTY.

REPORTED BY R. Q. ROACH, CALIFORNIA P. O.

The best bottom and prairie lands in Moniteau, well improved, are worth about $40 per acre. Good land of second quality fairly improved rates at from $10 to $25 per acre. Hilly and rocky lands, much of which can be made to yield well by manuring and clearing, may be bought at from $5 to $10; there cannot be said to be any unsettled land. I think the capabilities of our soils are beginning to be well understood by our people. All our farmers, nearly, are taking good care of land, clovering, manuring and turning more attention to blue grass and wheat and raising less corn every year.

MONROE COUNTY.

REPORTED BY WM. S. FORSYTH, STROTHER P. O.

Have had a remarkably good season. All kinds of crops have done well. Nothing scarce here now but money. Pastures are as fresh and green to-day, Nov. 1, as midspring. Young stock (mules and cattle) are very high. Hogs are plenty and in good healthy condition. This

county is well adapted to farming and stock raising. Not much land unfenced that is susceptible of cultivation. Farms are selling at $20 to $35 per acre. A good, quiet, orderly class of people. Kentuckians, Virginians and New Yorkers and natives comprise a large majority of the people.

MONTGOMERY COUNTY.

REPORTED BY OSCAR MONNIG, AMERICUS P. O.

Prices of lands: Missouri river bottom, $50 for improved; prairie lands, $20 to $25 for improved; creek bottom, $30 for improved; uplands, $12 to $15 for improved. There is no unsettled land in market in this county. Character of county, one-half prairie land one-half bottom and uplands. Adaptation Missouri river bottom: Best for corn, wheat and tobbacco; will not grow blue grass; poor for pasture; bad water. Adaptation for prairie lands are best for grass, oats, meadows and pastures. Adaptation creek bottoms: Good for corn, wheat, tobacco; good for blue grass, clover and meadows and pastures. Adaptation uplands is fine for blue glass, nice for pastures and orchards, vineyards and timber. Errors in farming: Too much grain raising on lands not adapted; no proper rotation of crops.

NEWTON COUNTY.

REPORTED BY CHARLES MCKINLEY, GRANGERVILLE P. O.

Owing to the chinch bugs, corn is light; wheat all threshed; winter crop all sowed and in good condition; apples above an average crop; stock in good condition; no disease in hogs or cattle reported. Land ranges from $25 to $40 per acre for improved, and from $10 to $15 for unimproved; very little of any value that is not settled.

OREGON COUNTY.

REPORTED BY J. J. SITTON, GARFIELD P. O.

Our county is best adapted to raising stock, cattle, sheep and hogs. There is quite a lot of unimproved lands in our county for sale at low figures, and a few homesteaders might locate to advantage on the public domain in the south part of this county yet.

OSAGE COUNTY.

REPORTED BY W. A. FERGUSON, CHAMOIS P. O.

Taking into consideration our timbered lands, we cannot raise wheat for less than $1 per bushel. We had, here, during the month of September, 5.62 inches of rainfall; over four inches fell during the last eight days of the month. Stock of all kinds are in excellent condition, and there is an abundance of feed. We have a variety of soil here, from rich, heavy bottom to thin upland, and prices range from $5 to $50 per acre. Our county is adapted to wheat and tobacco; we raised of the former in the years of 1883–4, something near 400,000 bushels per year; of the latter, I cannot say.

OZARK COUNTY.

REPORTED BY T. P. SIMS, GAINESVILLE P. O.

Government land is $1.25 per acre; unimproved land deeded, $1.50; cultivated land $2 to $10. Plenty of government land open for settlement under homestead pre-emption and cash entry. The county is best adapted to stock raising; fruits of all kinds and grapes do extra well; but very little attention paid to the business. The greatest fault with farmers is indolence. Good place for farmers and stockmen with small capital.

PEMISCOT COUNTY.

REPORTED BY GEO. W. CARLETON, GAYOSO P. O.

Owing to the late terrible overflows from the Mississippi river, stock raising has become very expensive; thousands of head perished in the floods; therefore, creameries are out of the question here.

PERRY COUNTY.

REPORTED BY CLAUDE W. SCHORT, PERRYVILLE P. O.

The surface of the county is broken and undulating, supporting fine forests of timber for building purposes, with rich soil. Our improved land is worth from eight to forty dollars per acre.

PETTIS COUNTY.

REPORTED BY V. T. CHITTON, SMITHTON P. O.

The lands in this county are worth from $10 to $50 per acre; price governed by improvement, quality and location; but little unsettled land in the market. The county is adapted to every crop that grows in this latitude, and is especially adapted to the raising of stock. The great error of our farmers is in not growing more grass and adopting a system of rotation in crops.

PHELPS COUNTY.

REPORTED BY GEORGE SMITH, EDGAR SPRINGS P. O.

Would estimate price of our lands at about $2.50 to $20 per acre—latter price near our towns. We have some unsettled lands, but generally of a poor quality. Phelps county is broken and timbered except some small prairies, and is best adapted to the raising of live stock, horses, cattle, hogs and sheep. I think sheep husbandry would be profitable here, but so far has been neglected. Our farmers crop more than they can profitably cultivate; raise too much grain and too little stock, but are gradually beginning to see their error, sowing more meadows than they usually have done, by which means they will save their soil much labor and receive a greater income from their investment with much less labor and expense.

PIKE COUNTY.

REPORTED BY DR. H. B. BUTTS, LOUISIANA P. O.

The price of land is from $10 to $50 per acre, according to location and improvements; know of no unsettled land in this locality. We have a variety of lands adapted to various purposes, prairie, timber and bottom, well adapted for dairy farming, but little of it is done. We want more dairy farmers. The opening is good here for that class of farming. There are very few of our farmers here that know how to make money out of cows, and it is only by having those settle among them that do know that they will ever learn. Do not think a more favorable locality could be selected for dairy farming than here.

PLATTE COUNTY.

REPORTED BY JAMES B. GOBBEND, WESTON P. O.

Lands in this county vary in price, perhaps as much as any county in this State, being all the way from $10 to $100 per acre; perhaps an everage of about $30 per acre. No unsettled land in the market. Rich, rolling, timber and prairie land, mostly timber; adapted to any crop that will grow in this latitude, wheat, corn, oats, rye, potatoes, barley, hemp, flax and tobacco; can't be surpassed for apples; almost equal to Kentucky for blue grass.

PULASKI COUNTY.

REPORTED BY JOHN T. QUINN.

All crops adapted to this climate do well here, wheat, oats, corn, potatoes, sorghum, tobacco, garden vegetables, etc. The raising of live stock pays the farmers better than anything else, as we have an abundance of wild pasture. Our county is hilly, moderately well timbered; the valleys are exceedingly fertile and well-watered, with plenty of water power. The price of land depends on the quality, some not worth anything, only for the grass, while that fit to cultivate is good, and varies in value from five to twenty-five dollars per acre. No government land of any account; railroad land from $2.50 to $5.00 per acre on seven years' time. All immigrants coming to this section of the county with some money do well, for it takes money to make money.

PUTNAM COUNTY.

REPORTED BY B. H. BENFORY, UNIONVILLE P. O.

We have one of the best stock counties in the State; blue-grass and the clovers seem to spring up and grow spontaneously. Price of lands will run from $5.00 for unimproved land, up to $25 for well-improved prairie farms. We have a large quantity of land laying out that will make good farms. We have a fine opening for some good party with capital to open up. A creamery in our county seat. I do not know of any more favorable spot in the State where all prospects point to success any more strongly than here. I will be glad to give any information in my power to any interested party.

RALLS COUNTY.

REPORTED BY A. B. WATSON, SAVERTON P. O.

The prairie lands of this county are principally adapted to the cultivation of corn, oats and hay, and raising of stock, and are worth from $15 to $40 per acre. Our timbered lands are adapted to the various products raised in this latitude, and for wheat and fruits of all kinds, cannot be excelled, especially for apples, and are worth from $3 to $50 per acre.

RAY COUNTY.

REPORTED BY FRED. B. CAMPBELL, LAWSON P. O.

This section is devoted almost exclusively to stock, corn and grass, hay and pasture. All the grain raised is fed out; none has ever been shipped. Only a few oats are sowed, and a part of them are consumed on the ground by hogs. Our land ranges in price from $10 to $50 per acre, owing to improvements. There is some unsettled land, mostly timber, that can be bought low. Some improved farms can be bought very cheap; some, you know, always wanting to sell. I will be pleased to show any one what we have in land. Good, reliable help is hard to obtain; and our farmers think there is more money, with less work and worry, in grass and stock. There was an effort made to establish a creamery at Lawson last spring, but it did not succeed.

RANDOLPH COUNTY.

REPORTED BY JAMES H. P. BAKER, CLIFTON P. O.

Price of improved lands, twenty to forty dollars per acre. No unsettled lands except swamp. Adapted to almost everything that grows in this latitude. Chief products are rye, corn, wheat, oats, tobacco and hay. Our chief sources of revenue are stock, hogs, sheep, cattle and mules. Randolph has developed into one of the leading stock counties. We ship no grain, except wheat, but feed it all to stock. Have not got an elevatar in the county, and don't need any. Our stock has been greatly improved within a very few years.

RAY COUNTY.

REPORTED BY ALEX MAITLAND, RICHMOND, MO.

Estimate a loss of twenty per cent. of hogs from swine plague. Reports from Southwestern portions of the county say some cattle are

dying from disease not known. No severe frost until October 16th. Wheat generally looking well; about fifty per cent. still on hand. Land in county mostly settled up. Price from eight to fifty dollars, according to location. County specially adapted to growth of corn, wheat, oats, tobacco and grasses. About equally divided between timber and prairie.

REYNOLDS COUNTY.

REPORTED BY JOHN S. LUTHY, EDGAR HILL P. O.

The reason why wheat is put down at 50 per cent. is that owing to drouth a great many refused to sow, while others are not done yet. Mine was sown the last of August and looks splendid. Land sells from $10 to $30 per acre. Plenty of wild land to sell here, well timbered with pine, oak, etc.

SALINE COUNTY..

REPORTED BY R. J. MCMAHON, MARSHAL P. O.

On account of excessive and freqaent rains, wheat seeding is greatly behind—many not yet done. Corn is damaged by the rain, and unless we have dry, cold weather, it is feared that it will be further damaged.

[Our correspondent does not mention that Saline is one of the best counties in the State.—Sec'y.]

SCHUYLER COUNTY.

REPORTED BY J. R. RIPPEY, GLENWOOD P. O.

Best cultivating land worth from $25.00 to $30.00 per acre; good land worth that with no improvements but fence. Some rolling tracts, all susceptible of cultivation, and a fine quality of tobacco land can be bought for $15.00 to $20.00 per acre. No unsettled land, except what we call stump land, very rough, with timber taken off; this land is worth from $2.50 to $7.50 per acre; lies on breaks of Chariton river; produces fine clover and blue grass and good tobacco. All our land produces as fine timothy, clover and blue grass as grows. Pepper Tobacco Co., St. Louis, say we have as fine tobacco soil as there is west of the Mississippi. Corn, wheat, rye, oats and barley are not extra, but will about average with the State. For the last ten years I have not

failed to raise from fifty to seventy-five bushels of corn to the acre, but this is above an average of the county. This was because I rotated my crops and used only good ground for corn.

SCOTLAND COUNTY.

REPORTED BY G. W. LANCASTER, CRAWFORD STATION P. O.

The price of land in this county runs from $15.00 to $30.00 per acre. There is no unsettled land here. Land in this county is best adapted to raising corn, oats, rye, grass and tobacco. Wheat is not a very certain crop here.

SCOTT COUNTY.

REPORTED BY E. B. MILLS, SIKESTON P. O.

Land ranges from $1.00 to $50.00 per acre. There is a large quantity of unimproved land in our county which can be purchased for $1.00 to $5.00 per acre. Our improved lands sell at from $20 to $50 per acre. Our principal products are winter wheat, corn and potatoes, for all of which our soil is admirably adapted. We also raise an abundance of timothy, oats and clover hay for home consumption. Horses, mules, cattle and hogs are the principal live stock raised, although we have some sheep and goats. The principal error of our farmers has been to run their land in corn for too great a number of years, but this error is rapidly giving place to rotation with either wheat or clover, the latter being much the best where a speedy reclamation is sought.

SHELBY COUNTY.

REPORTED BY JESSE E. BISHOP, MAUD P. O.

Improved farms on the high rolling prairie, well improved, sell at from $25 to $30 per acre; small farms selling the highest, as the buildings on a small farm cost about as much as on a large farm. Flat river bottoms and timbered farms can be bought for from $7 to $15 per acre, according to location and fertility. There is no wild land in this county fit for cultivation, being only good for pasture; it is worth from $2 to $5 per acre. The soil here is best adapted to timothy, blue-grass, clover and all tame grasses, and they grow to perfection here. A meadow of timothy and clover on my fathers farm, sown 37 years ago, produced better crops each year until 2 years ago, when they got run out by blue-grass. This is also a fine corn and oats soil. Wheat don't do well here.

ST. CLAIR COUNTY.

REPORTED BY J. H. ADAMS.

St. Clair county, north of the Osage river, is a splendid agricultural district. Corn raising and feeding stock are generally pursued. A large mount of flax is raised for seed. Some castor beans are raised; and millet grows to perfection, making from four to six tons per acre. There has been shipped from Appleton City seven hundred cars of corn of last years crop. There is a great deal of fruit raised here, and we have a packing fruit house and steam evaporator. The land is rolling prairie with timber on the little streams, which are only a few miles apart. There is plenty of stone and coal in every neighborhood, and nearly every 160 acres of land has a nice hill for buildings. Improved land near town, say from one to three miles, is worth $40 per acre; from 6 to 8 miles from railroad $25 per acre. No vacant land north of the Osage; south of the river is wooded hills with rocks.

ST. FRANCOIS COUNTY.

REPORTED BY A. H. BAKER, LIBERTYVILLE P. O.

Best farming land slightly rolling, deep red soil, well improved, worth $30 to $40 per acre. Second class, slightly rolling, well improved, $20 to $25. Thin lands, common improvements, $10 to $15. There is much hilly, rocky lands here, comparatively worthless, except for fruit, which would be a profitable business, if intelligently conducted. This is better adapted to fruit growing than any other part of Missouri. A canning establishment would do well here if begun at first on a small scale. Farming lands are well adapted to grain, fruit, grass, potatoes and stock raising, which is receiving great attention. Farmers have injured their lands by neglecting to grow clover, but that now is receiving more attention, consequently we are getting larger yields of grain.

ST. LOUIS COUNTY.

REPORTED BY T. C. CAMPBELL, MANCHESTER P. O.

The average price of land in this county is about $75 an acre for the western and northern parts. From the center of the county toward the city of St. Louis, the price rises rapidly from $75 to $200 for small lots. But little land is being sold. New comers pass through to cheaper lands. The soil is red clay, and well adapted to wheat and

clover, wheat having been the principal crop for one-third of a century. Lately, more attention is given to private dairying. The great error of this section is, that too much has been hauled to St. Louis and nothing returned to the land.

STODDARD COUNTY.

REPORTED BY DAVID HAWLEY, ESSEX P. O.

We have a fine lot of swamp lands, adapted to the growth of corn, potatoes, wheat, oats, and almost any crop we wish to raise. Good summer and winter range make it a natural stock-raising county; stock generally are healthy. Land is worth from three to ten dollars per acre.

SULLIVAN COUNTY.

REPORTED BY LEWIS N. FROYER.

The price of land in this county varies from $5 to $20 per acre, there being very little unsettled land in the county. The surface of the county is rolling, and some places quite broken, with a light, rich, sandy loam, and is especially adapted for grazing purposes. The raising of cattle is the chief industry.

TANEY COUNTY.

REPORTED BY J. C. BROWN, EGLINGTON P. O.

The price of land is from $2.50 to $10 per acre. There is plenty of unsettled land in this county that settlers can get by the taking. The county is best adapted to stock-growing, though the farm and garden pay well.

TEXAS COUNTY.

REPORTED BY E. W. WILSON, OSCAR P. O.

Land in this county ranges from two to twenty dollars per acre, according to the improvement and character of the land. There is a great deal of unsettled land here, most of it owned by speculators. It can be bought at from one to two dollars per acre; the most of it is not fit for agricultural purposes. We have very fine ranges in the summer, lasting from six to seven months in the year.

VERNON COUNTY.

REPORTED BY JOHN S. HATTON, SHELDON P. O.

The corn crop is not as good as we thought it was in September; it is going to weigh light. Broom corn was good, but cannot give quantity raised, per acre. The acreage is small here. The wet weather is spoiling the potato crop.

WARREN COUNTY.

REPORTED BY RYAL J. RENNETTS, WRIGHT CITY P. O.

Land in this county ranges in price all the way from $5 to $35 and $75 per acre. Some of our farmers undertake to cultivate too much land and make to some extent a failure; grass is the remedy for such failures.

WASHINGTON COUNTY.

REPORTED BY THEODORE SLOAN, IRONDALE P. O.

Well improved lands are worth from 15 to 25 dollars per acre, yet there is land here that can be had for much less. There is unimproved lands here for from 2 to 4 dollars per acre, but very little for homesteads. This, Washington county, is more of a mining district, yet, much of the county is well adapted to grazing purposes. Plenty of water and timber. I cannot say that our farmers are negligent or slovenly in farming, but on the contrary, most of them do their work well, and if failure comes it is on account of a poor season.

WAYNE COUNTY.

REPORTED BY A. M. CARTNER, COLDWATER P. O.

Farming land ranges from five to twenty dollars per acre, according to quality and location; this includes improved and timber land. There is very little unsettled land in the market that is fit for cultivation. This county is best adapted to stock raising; so our farmers are abandoning "grain for market," and adopting that of more hay, more corn, and more and better stock.

WEBSTER COUNTY.

REPORTED BY B. B. PECK, ROGUSVILLE P. O.

We have an average quality of land. Unimproved land is about five dollars per acre; improved land is from ten to twenty-five dollars per acre. There is much unimproved land here that is fit for cultivation. Farming in this county is about an average of the State.

WORTH COUNTY.

REPORTED BY G. T. BROWN, DENVER P. O.

The price of farms vary from $15 to $30 per acre, according to location and improvements. Wild land is all owned by individuals, and held at from $8 to $15 dollars per acre. Our county is well adapted to wheat, corn, potatoes, sorghum and all other crops raised in the fortieth latitude, also it is an excellent county for cattle, sheep, hogs and horses.

WRIGHT COUNTY.

REPORTED BY A. D. GRIFFIN, MOUNTAIN GROVE P. O.

Unsettled and unimproved land is worth from $3 to $8 per acre; improved land is worth from $5 to $25. Our county is best adapted to fruit and stock. There is a great deal of unsettled land in this and surrounding counties. Our county is in a very good condition. Shallow plowing is one error of our farmers. Not enough shelter for stock is another error. We have no creamery or cheese factory in our county.

MISSOURI CROP REPORTS.

OFFICE OF MISSOURI STATE BOARD OF AGRICULTURE,
COLUMBIA, Mo., April 8, 1884.

In response to 450 circulars of enquiry sent to correspondents in every county, the following averages are found from those responding:

Average condition of wheat April 1st, 97; eleven report extra, 144 say average or good and 35 report poor. Seventeen and seven-tenths per cent. of the wheat crop of 1883 is reported as in farmers' hands, and 1,268,000 bushels in elevators outside of St. Louis and Kansas City.

Of the corn crop of 1884, 24 per cent. still remains in farmers' hands.

Rye—condition April 1st, 97. Per cent. loss of cattle, 2.3; of hogs loss 7.3 per cent. Cattle very generally reported as healthy and thin, from severe weather and poor corn. A heavy loss of small pigs is reported from severe weather. About 1-4 of the counties report cases of hog cholera. Frequent cases of influenza in horses are noted. In their present condition, all classes of stock are represented as unusually healthy, excepting moderate complaints that sheep are languishing. An estimated decrease of 5.5 per cent. for cows; 10.7 per cent. for other cattle; 7.6 per cent. for sheep; 4.8 per cent. for swine and no loss of horses and mules is made from correspondents' reports.

J. W. SANBORN, Secretary.

CROP REPORTS.

OFFICE OF MISSOURI STATE BOARD OF AGRICULTURE,
COLUMBIA, MO., May 20, 1884.

Reports have been received from 100 counties of the 114 of the State. Most of the correspondents speak most favorably of the outlook for wheat. Many say, "Extra," "Never better," etc., while a few still report the prospect as below the average. A few of the more recent returns speak of the Hessian fly as doing considerable damage. As compared with May 15, 1883, the present average is 110. Very little wheat is reported as being plowed up. Spring wheat is reported in only a few of the northern counties. But a few counties report barley. The acreage remains about the same as last year for these grains. The acreage of corn as compared with 1883, is reported as 100.44. Reports represent the planting as very backward. and the soil as in poor fix for seed. The proportion now planted is stated at 45.per cent. of amount to be planted, and probable germination as 81.41. Peaches are represented as likely to be a complete failure, few only reporting a small promise of peaches. Other fruit prospects are very hopefully spoken of except, occasionally doubts, where hail and wind have injured or cold, as in case of blackberries, in some localities.

The percentage of spring pigs as compared with 1883, averages for the State 89.2 per cent. The area of oats is placed at 96.5. At the date of writing, the weather for planting has become more favorable and putting in of corn is now going forward rapidly. The continuous cool, wet weather has tempted planting on soil unfitted for the reception of seed, and puts corn at a disadvantage from the start. Considering the present favorable condition of stock coupled with crop prospects to date, our farmers have no cause for complaint, but fair encouragement.

J. W. SANBORN, Sec'y.

CROP ESTIMATES.

OFFICE OF MISSOURI STATE BOARD OF AGRICULTURE,
COLUMBIA, Mo., June 24, 1884.

Returns from circulars sent to 450 townships of the State give the following report of the condition of the growing crops compared with an average year:

Wheat 93, corn 87, oats 95, barley 88, hay 100, clover 98, small fruits 91, apples 87, cattle 102; acreage of flax compared with 1883, 77; acreage of sorghum 92.

Harvest is expected to be ready about the 23d in southern Missouri, and about a week later in northern Missouri. But little complaint is made of either the fly or the rust. Southwestern Missouri complains of drought, while other sections report an excess of moisture. Cheat seems largely responsible for the decline, reported, from an average crop. In exposed situations the stand of wheat is somewhat thin. Cheat is reported in most of the counties. In many of them it is very slight in amount; in others it is reported from little to 30 and even 50 per cent. These larger figures are for only isolated sections or farms, and in most cases, I have reason to believe, is exaggerated in amount. The cases reported are where wheat has followed wheat. From this fact let none reason in favor of the old exploded folly that wheat turns to cheat. Succession crops of wheat form a poor practice, foreign to good management. The best crops are reported after clover, and in such cases wheat is clear of cheat. 93 per cent. of an average crop means, upon the acreage reported by the National Department of Agriculture of 2,334,767—25,612,383 bushels. The average crop of the State is rated at 11.8 bushels, or that found for the past ten years. If the average of the past 5 years is taken as a basis, then this estimate is 466,953 bushels too high. At the present writing the returns are growing more favorable. Corn is reported two weeks behind in growth, and

as having a surplus of rain for the most of the State. But little complaint is made of the stand, and the prospects are improving for all.

Clover is reported as injured, to a slight extent, by excess of rain. The following questions were answered as follows, to wit: to question 1. What period of growth is timothy cut in your county; 49 answered at dates varying from early seed to maturity, or ripe hay, 48 from bloom to early seed, and 22 in bloom, or 119 answers; and to question 2. "At what period do you farmers desire to cut timothy; 16 answered at periods varying from early seed formation to ripening; 47 from dropping of bloom to early seed, and only 20 favored cutting in bloom—two or three favoring early bloom. Many more answers were received, but many gave dates, which of course gave no indications of degree of maturity of plant, and some gave equivocal answers. On the basis of four years of special investigation of this question in feeding and weighing crops, the writer advises cutting when the seed has formed, but, surely before it hardens.

But one county reports castor beans.

Respectfully reported,

J. W. SANBORN, Sec'y.

CROP RETURNS.

OFFICE OF MISSOURI STATE BOARD OF AGRICULTURE,
COLUMBIA, Mo., August 5, 1884.

The returns of correspondents to this office for August 1st represent a most unfavorable month for harvesting hay and threshing grain, except in some counties south of the Missouri river, that complain of dry weather. A small fraction of wheat had been threshed or stacked August 1st and was suffering in quality and sprouting. Fair weather has since set in and the damage, extensively reported, will be found exaggerated. Wheat is estimated at 14.04 bushels per acre, which is 2.24 bushels more than the average for the past ten years. This gives 32,780,114 bushels as the probable yield for the State. Threshing returns may modify this estimate, but will not decrease it unless through ruined wheat. The quality is about an average, 120 reporting quality average, 30 above average and 31 below average. The present condition of corn is 100 and still improving. Average yield of oats per acre 31 bushels, being above an average crop. Hay is a grand crop, estimated al 1¾ tons per acre. Fruit, or apples, mainly, is 72 per cent of a full crop. Potatoes 100, and pastures 103, the latter being seldom surpassed for July. Live stock are thriving finely and free from disease, save a few reports of hog cholera. The season is reported remarkably free from insects injurious to vegetation, the rain restraining threatening chintz bugs. Twenty per cent. of plow lands are represented as in meadows, which is much more than reported in census of 1880, due in part to a wise change in the views of our farmers, who are coming to see that more grass and stock and less wheat and corn sales are for their interest. Fifty-one report the Fultz the earliest variety of wheat to ripen; fifty-nine name May wheats, namely, May, Early May, Little May, Red May, White May and Big May, while a multitude of other wheats have from one to five friends. Fultz was named by 71 as the best variety; 26 favored the Mediterranean; 8, the May; while Clawson, Walker, Gypsy, Red Sea, German Amber, Blue Stem, Canada, Dresden, White, Swamp, Turkey, Sea Island and Tappahannock

had one to four friends each. As the best variety, 57 favored the Fultz; 21 the Mediterranean; 10 the May; 5 the Walker; 5 the Tappahannock and 7 the Red Sea. Fultz is particularly favored for upland fields. Fultz seems to be the favorite wheat of Missouri farmers. I may add that of, perhaps, 150 varieties tried at the College farm, Fultz has, for all qualities, maintained first place. In our live stock and crop interests this is one of the most abundant, perhaps, in all respects the most bounteous year in the history of the State.

Reply to questions shows that in addition to timothy, red top and red clover, orchard grass, millet and Hungarian grass are being grown in increasing amounts. More attention, especially to mixed grasses for our pastures, should be given.

It is proper to add that these reports are made officially from returns of correspondents in all our counties and impartially on the facts presented. The data are retained in this office and are open to inspection at all times to any one.

Respectfully,

J. W. SANBORN, Secretary.

CROP RETURNS.

OFFICE OF MISSOURI STATE BOARD OF AGRICULTURE,
COLUMBIA, MO., September 22, 1884.

Crop correspondents, in reporting to this office for a month, to September 15th, report for many counties of southern Missouri a period of drought of such extent as to injure the corn harvest. S. E. Shaw says, for Dade county, "that the dust has hardly been laid for eight weeks." Bollinger county reports no rain since July 27. A very large section south of the Missouri has had its corn crop restricted by the effects of drought. North of the Missouri no complaints of dry weather affecting corn are reported. On the flat prairies, or wet undrained sections north of the Missouri, many report that the continuance of unfavorable weather will endanger the maturing of corn. The great bulk of corn is, however, made. Very few reports of damage by insects are received, and are confined to ravages of chintz bugs on late corn. The staple crops of the year are now virtually made, and justify our previous observations that 1884 is one of the most bounteous years in the history of the State, when all of its crops are included. Nothing like failure has occurred in any one of our important staple crops, while nearly all of them average high.

The effect of the low price of wheat is revealed in the answers below. Our farmers regard the price of wheat as too low. Many report one dollar as a price necessary for adequate profit on wheat production. J. L. Erwin, of Callaway county, one of the best farmers, reports accounts with wheat production for five years, and concludes $1.00 as cost, profit included. Under favoring conditions, others report a profit at less figures. The figures below represent the actual reported cost of growing, at which sum it will not be grown under present conditions extensively. Corn, estimated yield per acre, 37.8 bushels. Total yield for the State, 226,656,291 bushels, the largest crop on record for Missouri. This may be modified by later returns. Estimate for potatoes, average condition, 100.5. Spring wheat, yield per acre, 13.8 bushels. Flax, yield per acre, 8.9 bushels. Beans, yield per acre, 23.6

bushels, a good crop. Sorghum, average condition, 97. Broom corn, acreage compared with 1883, 96.5 per cent. Wheat, area sown compared with 1883, 94 per cent. Root crops for stock feeding are not reported as grown to any extent. Estimated cost of growing a bushel of wheat, 59.4 cents. Estimated cost of growing a pig to 200 pounds, live weight, $5.88, or about 3 cents a pound. In the older sections of the State the estimate is nearer 4 cents a pound, while in southern Missouri, where mast abounds in abundant forests, the cost is rated at 2 cents and under.

Stock is healthy, and stock interests from abundant feed in unparalleled prosperity.

J. W. SANBORN, Secretary.

VALUE OF WHEAT.

ST. LOUIS, October 22, 1884.

J. W. Sanborn, Esq., Columbia, Mo.:

DEAR SIR—In answer to your inquiry for values of our wheats, etc., I shall have to go into some detail to make my answers to you plain.

First, we still have two styles of milling; the old millstones grinding of our grandfathers and the modern roller-gradual reduction process. The last being a great improvement, we are pleased to say, most of our go-head millers have adopted. We mention the two processes for the reason that some wheats, excellent for one process, are not good for the other. The principal white wheats of the Mississippi Valley are Blue Stem, White May, Tappahannock, Red Mediterranean, Fultz, Red May and Golden Chaff.

For old-style stone-milling, the best mixture and the one that made the reputation of St. Louis flours, was one-third White May or Blue Stem, two-thirds Red May or Golden Chaff. These wheats, the whites especially, are very largely starch and were used for color. The reds are only moderately hard, all containing a large per cent. of gluten, but of an excellent quality, so that flour made from this mixture made a large white *loaf of bread.* The small per cent. of this excellent gluten being strong enough to raise the large per cent. of starch. The roller-gradual reduction changes this. The process is just what it is called, gradual reduction, cutting or breaking the wheat gradually into small pieces called middlings. The white wheat being very starchy and soft, crush in place of breaking when the rollers comes into contact with them; hence they are not wanted in this process. The wheats it wants are hard Mediterraneans and Red May.

The Mediterraneans are the hardest, and for patent flour are the best, but only about twenty per cent. of the flour is patent, leaving eighty per cent. of clear and low grade. These are blueish to glutenish when made from all Mediterraneans, hence roller millers find it best to

make a mixture of wheats of about one-half Mediterraneans and one-half soft red. This mixture, on the same principle as the stone mixture mentioned, gives the roller flours the gluten from the Mediterranean, and the starch and cream color form the soft red, making a strong white flour; influence of climate on wheat. Our experience is, the further South the more starch in the wheat and smaller per cent. of gluten, but better quality of gluten. The further north, the more gluten and smaller per cent. of starch, but poorer quality of gluten, which means darker bread.

Soil, also, has its influence; soft wheats raised in same state vary; high, rolling, sandy or clay soil produces harder, flintier wheat than low, or even level land.

The weather even, in milling the grain, has its effect in soft, muggy weather; flour clogs the bolts and comes out fine finish, but soft, while in clear, dry weather it bolts free, the flour being sharper and livelier, hence fall-ground flour is somewhat preferable. The reason, then, that we claim the superiority for Mississippi Valley flours, are as follows: First, that we have the various wheats, some that are largely composed of gluten, while others are largely composed of starch, the gluten being the raising substance and the starch the white color. Our millers, by mixing the various wheats, produce flour with the right amount of gluten to raise the bread with all the starch it will stand to give it color.

We will say, in conclusion, the French Graume machine tester of flour shows St. Louis flours to still maintain the lead against all others. Hoping this is the information you requested,

We are, yours truly,

F. HATTERSLY & CO.

GRAVEL ROADS.

BY M. G. QUINN.

A road may be properly defined as a passway for travel, and for the transportation of commodities. It is one of the indispensable requisites of civilization, and the degree of perfection to which the public roads of any country attains, is almost an infallible index to the character and thrift of the people. There is no feature of public interest so essential to the general welfare of the people as the improvement of their public roads, and yet it is a lamentable fact that no feature has been so grossly overlooked and neglected. Among the greatest blessings which any government can bestow upon its citizens are good public roads.

Without any desire to give this article the least political tinge, we wish to say that the power of the government, either state or national, to shape the policy and provide the means for the improvement of our public roads should be positive and compulsory.

A patriotic people will endure taxation for this purpose with more patience and satisfaction than for anything else, and whenever any community may desire to improve their common dirt roads and express that desire through petition or otherwise, and show their willingness to be taxed for this purpose, it should be the bounden duty of the proper authorities to comply and lend such aid and co-operation as their best interests may dictate—always making it a rule to be on the liberal side of the question. We believe in the creation of a public road fund something similar to the public school fund. Waiving the constitutionality of the question, if we could have been near Senator Blair when he was drafting his national school bill, we would have suggested also a national road bill, by which some of the many surplus millions said to be accumulated in the Federal treasury could have been appropriated

to the States, and by the States to the counties, for the improvement of our wagon roads.

The only two points we care to make relevant to this article, are:

1st. The best method of providing the means.

2d. The best mechanical method of improving our roads.

Regarding the first point we have already sufficiently hinted, to show the best of our views upon this subject, and prefer leaving the crystalization of the subject to the device and ingenuity of some wise solon of our General Assembly, giving him the positive assurance that if, in the profundity of his wisdom, he can devise some financial scheme for providing the means to improve our public roads, without taxing the people to death, without creating a bonded, interest-bearing debt, and placing the people's property under mortgage, he will cover his name with glory and receive the lasting gratitude of the people.

In regard to the second point, it is generally conceded that the best and most economical and durable way of improving our roads, is by grading and graveling or macadamizing. The plank and corduroy roads have passed into oblivion, except for mere temporary purposes. Experience has proven them to be neither safe nor durable.

The material for the construction of these metal roads is abundant and cheap in most parts of our country, and the roads can be built at a cost of from 3,000 to 5,000 dollars per mile, dependent upon the amount of grading, culverting, bridging and the convenience of material where the road is located.

For the specifications controlling the mechanical construction of these roads see proceedings of the Missouri Association of Surveyors, and civil engineers for 1883, held at Columbia, Mo. The money value of a good gravel or macadam road is difficult to compute, from the fact it is dependent on so many contingencies for its support. It is safe to assume, however, that when located in a reasonable productive and populous country, they will not only be self-sustaining but will pay a good profit on the investment. The principal consideration to the land holder is the increase in the market value of real estate, with good road facilities, land almost invariably doubles in value.

We knew lands in Boone county which could have been bought prior to the building of our gravel roads, for ten, fifteen and twenty dollars per acre, that cannot be had now for less than forty or fifty. Look at the States of Ohio and Kentucky: Why is it their lands bring from 100 to 150 dollars per acre, while ours of a better quality will only bring from $30 to $50? It is because of the number and superiority of the roads for which these two States are famous. This increase in the market value of real estate has been urged as an argument against the

improvement of our roads by that class of land owners, who claim they want to hold their lands for a homestead, and this increase in market value also increases the tax value, while it does not increase the productive value.

We never accepted this as a genuine argument, although it looks plausible, for it would be a reflection on the pride and ambition of human nature, to say a man would prefer owning a home in the wilderness, worth only ten or twenty dollars per acre, to one on a good public road worth fifty dollars per acre. The second consideration to the farmer in computing the value of a good metal road, is the increased facilities it affords for travel, and the transportation of his products to market.

It has been practically demonstrated in Dynamics, that an ordinary span of mules or horses, will draw with ease, on a good level road with hard smooth surface, about 4000 pounds at one load.

Up a slope of 1 foot in 44 feet, or 120 feet to the mile, they can pull only 3,000 pounds; up a slope of 1 in 24, or 220 feet per mile, only 2,000 pounds; up a slope of 1 in 10, or 528 feet per mile (the average slopes of our ordinary dirt roads,) they can pull only 1,000 pounds.

That is as the steepness of the slopes of roads increase the capacity of the power to draw over them decreases in a ratio corresponding to the increase steepness of incline of 25 per cent. From this basis let us make a practical illustration: Suppose a farmer lives ten miles from market, and has 4,000 pounds of products to sell; if he is on a good metal road he can transport it to market and return in one day, at a cost, say, of the ordinary price per day of teams, $2.50; if he is on a mud or dirt road he can transport it in 4 loads, or 4 days, at a cost of $10; the difference is $7.50 on 4,000 pounds, or about one-fifth of a cent per pound, in the cost of transporting products to market, to the credit of the gravel road and against the common dirt road. From this illustration, which is not extreme, the farmers can readily see the advantages of gravel roads.

Twenty cents per hundred pounds on all the products of any farming community, drawn to market, would soon create fund enough to build all the gravel roads we need, to say nothing of the extra convenience and comfort of travel, and the wear and tear of teams.

Any of the counties in Missouri, with proper management and energy, can soon have all their principal roads graded and graveled, or macadamized. The great trouble with most of the counties is that they are too slothful towards these enterprises, and when the fever does strike them they want to do it all at once, and in their zeal overreach themselves and become financially involved. These roads should

be built gradually in proportion to ability, and in the course of time all the important roads can be improved without incurring any interest bearing debt. We hope soon to see the day when the people of Missouri will awake to the importance of gravel roads, and our noble young State will then become the arcadia of this republic, in the way of beautiful homes and splendid roads.

Respectfully,

M. G. QUINN.

WHAT WE KNOW ABOUT SILK CULTURE.

Having had a little book sent to us upon the subject of silk culture and the great profits which could be realized from the "Light and Easy" industry, we resolved to try the experiment ourselves. In April we sent for one ounce, or five dollars worth of "silk seed," in a few days it arrived in a small button box, and that small button box contained four small sheets of paper, each paper being covered with tiny grey dots. A sight of this box and contents made us all feel as though the future silk industry of our beloved Missouri was a very small affair indeed. We felt as though we were badly sold as we wrapped up that five dollar button box in a piece of paper, took a bit of wire, made a hook of it and hung the future "Silk Industry" up in the cellar.

The 10th of May we brought them up into a south room, dipped a piece of white flannel into hot water, spread it on a small table, placing the sheets of paper upon the wet flannel. Each morning after the first we merely washed the table with very warm water; in this way avoided moving the paper, only lifting the flannel and all at once. The warm water evaporating furnished moisture and heat enough to ensure the hatching of the eggs.

Quite unexpected to us, upon the 15th of May, or in just five days, they began to hatch, in three days all were out. The first hatch we fed on two volunteer lettuce leaves, as the hedge leaves were not yet large enough, but upon the second day we began picking the hedge leaves, although they were very small. We put these leaves upon the paper and as soon as they were covered with the little black worms, which were not more than the eighth of an inch long, we lifted the leaves off, with the worms clinging to them, and put them into the tray. We had but one tray to begin with.

The first three weeks we wished we had sent for more than an ounce of eggs; and we resolved to go at it on a grand scale another season. We did not have half the trouble we had anticipated in getting food enough for them. All this while they were growing and

growing; suddenly their appetite could hardly be appeased, they ate and ate, while we worked and worked and worked.

We had them in a room nine feet high and 12x18 feet. There was a small window in the east and a large one on the west side of this room. For ventilation we always had these windows lowered from the top about six inches, except in case of rain, when we shut which ever one the rain drove through, opening it as soon as possible when the storm was over.

At first the weather was very cold and we had a fire in the room whenever we were feeding them and changing the trays, so we should be comfortable ourselves; as for them, they did not seem to mind the cold at all, and as they seemed to be so healthy we think they suffer more from too much heat than from the cold, yet they did not like a cold wind to strike them. About the fourth week the stove had to be removed from the room so another rack could be put up, for by this time we had two racks five tiers high, each tier holding five trays; also two racks more, four tiers high, each tier holding five trays, this making 90 trays in all. As the trays were still badly crowded, we made a smaller rack, which reached within a foot of the ceiling; upon this we placed all the finest and largest worms. Just here we wish we could say for certain how old they were, but we cannot, as we were all kept so busy (three of us and at times four) feeding, changing trays, making racks and trays, etc., and so we lost all knowledge of the flight of time; working on in sheer desperation, hoping the end would soon come. We think now, looking back upon the industrious past, that we were engaged in this "Light and Easy" business about one month.

Try to imagine our delight upon beholding the first cocoon; it hung among the branches a little lump of shining gold, for we had stuck brush all around the edges of the trays and arched them from the upper trays to the ceiling, and in every way did more in the way of work than we need to have done. Up to the time they began to spin not a dozen had died, except ten, which the black ants kiled, forcing us to place the legs of the racks in tin cans filled with water, and thus we were not troubled by the ants again. Now as a great many began to spin, and as we could not give that attention to all that they should have, we found numbers dead from having fallen from the ceiling to the hard floor, and for want of that attention which we could not give to all, and yet the room was too small. Two dozen ready to spin were taken out and placed in the hedge. That night we had a terrible rain, and the next day rain fell. In a few days we found ten fine cocoons, each well wrapped in a hedge leaf. Upon waiting still longer, we found something had eaten a hole into the side or end

of eight of those cocoons and taken out the "grub," while from the other two cocoons we found two millers had hatched, so we took the hardy little fellows and placed them in the box with the rest. Over the east window is a grape vine, and all about the window we found cocoons in the grape leaves, which they folded around them. They hung in great bunches from the ceiling, in some places as much as would fill a peck measure. Around the mop boards and door frame, the branches which had been tied together, and hung in the corner of the room were a beautiful sight to see. One cocoon was found in the hay mow, several in the shrubbery, another was found on the suspender of the "good old man of the house." We suppose in going back and forth into the room where they were, they had got among our clothing and so were carried about the premises, as they are very restless about the time they are ready to spin.

Well, we had, the final winding up of this light and easy industry, a general lack of interest in all things, a kind of a touch-me-if-you-dare feeling, a badly demoralized looking house, darning and patching loomed up mountain-high, and forty pounds of cocoons, only ten pounds real good hard cocoons. The rest were soiled, pierced, soft and waste silk, and no market for a bit of all this.

The reason for so much waste silk, was that the worms crawled around hunting for suitable place to spin, and crossed and recrossed the threads until the walls and windows were hung with a yellow and white curtain. Then, too, we should not have left so many leaves on the branches, as these soiled the cocoons very much. Yes, we shall try it next spring and let them spin in paper ; shall just crumple the paper up so they can crawl into the crevices, as those which spun in paper were clean, hard, and had little or no waste silk.

Then, too, we feel as if we had learned more from this practical bit of silk culture than if we had read whole volumes upon the subject, and that is worth much. Then we have the cocoons which, if we cannot sell, we can work up into pretty fancy articles, and we shall try to make something useful of them, too, during these long winter months. We know now that we undertook too much for new beginners for we had never before seen a silk worm, until we had them for our very own. We did not know what was required of us until the article was needed, and so we were kept rushed along through the last two weeks. We paid out another five dollars for lumber, tacks, twine and netting.

We have on hand a nice lot of eggs of both the yellow and white. We think the yellow the most hardy,

If a market could be found for cocoons, there are a number of persons who would engage in this new industry, each raising a few pounds,

and these many fews at last amounting to a great many. The great question with us now is not "Can we raise silk in Missouri?" but "Can we find a market for the cocoons?"

MRS. C. R. WALKER AND DAUGHTERS,
Mexico, Mo.

HEALTH HINTS FOR THE FARMER.

BY DR. JAS. F. HANNA, PROFESSOR OF PRACTICE OF MEDICINE, MEDICAL DEPARTMENT UNIVERSITY OF MISSOURI.

Man's food is derived from both the vegetable and the animal kingdom. Wholesome food, in proper varieties, well prepared and thus taken into the stomach and intestines and thoroughly digested, finds its way into the blood vessels, and after passing through the lungs, where it comes in contact with pure atmospheric air, by the aid of which the whole volume of the blood is loaded with material, which, when distributed by the arteries to any portion of the human body, promotes the growth of new tissues and repairs the waste in tissues and supplies force, both nervous and muscular. "The blood thereof is the life thereof," is certainly true with respect to the human family. You see, then, in order that a healthy individual may keep healthy, good wholesome food, well cooked, must be eaten, and pure air must be breathed. You see, I hope, that my object is not so much to give you directions in regard to treatment when you are sick (for then I would advise you to call a good physician and submit yourselves to his treatment), as it is to give you such suggestions as will prevent sickness in your families, if you will carry them out. The old adage, you know, says, "an ounce of prevention is worth a pound of cure." Bear this in mind, good blood is the product of good food and pure air. If the farmer can't have good food who can? By a little effort he can produce almost everything he needs in the way of something to eat on his own farm. He can raise vegetables of every sort and always have them fresh and crisp; he can propagate fruits in the greatest abundance, both large and small; and a prudent judicious

farmer will always reserve the nicest and best for home use; he can also use the choicest of meats, hanging high up in the meat-house the nicest hams, while the rougher pieces of bacon are sold, reserving for family purposes the tenderest steaks when the occasional well-fatted beef is slaughtered, using at home during the warm months the best parts of the carefully dressed mutton, to say nothing of nice spring chickens and fat Thanksgiving and Christmas turkeys. What a "bill of fare" a thrifty, careful farmer can furnish his family and guests' It is abundant and varied, and it is all good. With such a variety the appetite should always be sharp and the digestion not faulty. I am reminded now, I have failed to mention the nice rolls of yellow butter, sweet and solid, and the good rich cream and sweet milk, as well as the very palatable buttermilk. These all, then, add much to the "bill of fare," and besides are very useful in the preparation of many vegetables and fruits for dictary purposes, not only adding to their taste flavor, but also rendering them more easily digested and appropriated by the system. I have said the list of all the good things are for the farmer's household, and so they may be if he will, but the very fact of the best implies there are articles produced on the farm which are not on the best. This is a necessity in the abundance raised, all cannot be first choice. Inasmuch as good food makes good blood, and good blood is necessary to good health, I maintain that it is not only the farmer's privilege to live off of the fat of the land, but it is his imperative duty. Health is of the first importance. All earthly possessions are in no measure valueless without it. I believe I speak the truth, when I say very few realize how great a blessing good health is, until they have in some degree been deprived of it. Then all decaying vegetables and all imperfectly cooked vegetables; all tainted and poorly cured meats and poor meats, I mean meats made of animals not well fatted, and meats not cooked enough and cooked too much, should be divorced from the table. The reasons are two. Decaying vegetables may carry into the system germs of disease, which will seriously affect the blood by being introduced into it with the digested food, and if good vegetables are poorly cooked they may interfere with proper digestion, and in either case the quality of food suffers; so with meats if eaten without having been subjected to heat sufficient to destroy the parasites that often infest aaimals, they may give rise to painful and sometimes fatal parasitic diseases in the human subject, such, for example, as tape worm, which comes from eating raw or insufficiently cooked beef and pork, and trichinae which is produced by eating raw pork.

Again, if meats are cooked too much, if they are burnt to a crisp, they are thereby rendered hard to digest, and, because of that fact, are productive of mischief.

I have no hesitancy in pronouncing milk one of the very best articles of diet. It comes nearer fulfilling every object for which food is used than any other one article of diet. It contains, and readily yields, when introduced into the human system (because of its easy digestion), every element necessary for construction of tissues, or repairing them when destroyed by wear, and for supplying force, both muscular and nervous, and yet it is an article, capable, when not good, of producing incalculable harm ; and to keep it good and always have it so as to get the best results from its use, requires the closest adherence to the strictest measures of cleanliness, not only so far as taking care of the milk is concerned, but also concerning the care and feeding of the cows.

A turbid fountain don't send forth a clear limpid stream ; neither will a sow fed on swill, often containing, in addition to greasy dishwater, egg shells, tea and coffee grounds, etc., give good, rich milk, especially if she is fed and kept in a poorly ventilated stable and made to lie in her own filth—certainly not. The milk will not only smell but will taste of the filthy surroundings, and, of course, is unfit for use. Every one knows this truth. Isn't the milk often unfit for use in spring time because the cows have topped the wild onions? You don't see them eating the offending things, but you tell it quickly when you taste the milk. A cow can no more give good milk when fed on filth and swill than she can give odorless milk when she feeds on wild onions.

Good milk is food already prepared for the human subject. The cow consumes in her food articles that we use, and her digestion of the corn meal and ship stufs, and conversion of them, and kindred articles, into good milk, are far ahead of any cooking processes we can invent, so you see the milk is, in a very practical sense, cooked food, and our feeding and caring for the cow are in the same sense cooking; the whole matter of food then, so far as it relates to making good blood and thus promoting good health may be summed up thus, select the best vegetables, fruits, meats, fowls, cook them all well, including the milk, and use them "as not abusing them."

It is seen, I hope, that good food is absolutely necessary in order that there may be good blood, and consequently good health; but good food alone will not bring about this most desirable end. Something more is needed. Pure air is almost if not quite as essential as good food. Please let me indulge in a little physiology. The veins carry blood,the nourishing properties of which have all been used, and their blood is loaded with material that is no longer needed for the growth of the different parts of the body, until it has gone through a purifying

process, which it does in the lungs. This change is brought about by breathing into the lungs atmospheric air. Atmospheric air contains about seventy-nine parts of nitrogen gas, about twenty-one of oxygen and a trace of carbonic acid gas. This combination is exactly right to the demands of the human system, serves, when taken into the lungs, to purify the blood and load it up with such material as are needed to support human life and promote health. The change that takes place in the lungs is chiefly that the oxygen of the air taken in by breathing is taken up by the blood, and carbonic acid is given off, is exhaled. Carbonic acid gas is poisonous to the human subject, but is readily used by plants. Remember that normal atmospheric air has only a trace of carbonic acid gas. Now, don't you see that the largest products of expiration in breathing is carbonic acid gas. It is estimated that one individual, in a close room, filled with normal atmospheric air, will render unfit for breathing about four hundred and eighty cubic feet of air every hour. Remember when carbonic acid gas is so increased that it constitutes ten per cent. of the atmospheric air in an apartment, that this room of air so contaminated will not sustain life. Please remember, too, that breathing is one chief source of carbonic acid gas in a room occupied by human beings.

Now look for a moment at modern farm houses; most of them include from three to six or eight rooms, including kitchen and halls, some of these well ventilated and some of them very poorly.

Say a room is 15 by 15 feet with a ten foot ceiling, and has three medium sized windows, each of which fit moderately close, with blinds on outside and curtains on inside, and a stove is used for heating. The idea is to have the rooms close keep the cold air all out and less. fuel will be consumed. Let us calculate a little and we find such a room capable of containing 2,250 cubic feet of air—grant that it is pure air. Two persons are put in the room to sleep and the door is shut; not much fresh air can get in and not much bad air can get out, comparatively speaking. One person needs four hundred and eighty cubic feet of pure air every hour and here are two persons shut up in a tight room with only two thousand two hundred and fifty cubic inches of good air, to sleep at least six hours each, requiring each at least 2,880 cubic feet of air. Is it strange at all that the room should be filled in the morning with a bad atmosphere, one that is almost, if not altogether unfit to sustain life? Then add to this the possibility of a lamp burning a good part of the night, which renders the atmosphere unfit for sustaining life by consuming the oxygen of the air. Now where will such a cause lead? First, this impure air does not perfectly correct the impure blood, and of course the impure blood is dis-

tributed to the system, and as a consequence some parts are not properly nourished, and after awhile the appetite fails, digestion is faulty and the individual may, as a result, die indirectly of starvation. The remedy, in the way of preventing the long train of ill consequences that come either directly or indirectly from breathing bad air, is in your own hands.

Your ancestors used it, whether knowingly or not, I can't say. They didn't use close rooms 15 by 15 by 10 for two, but often a 16 by 18 by 7 for a large family to cook, eat and sleep in. There were numerous cracks, doubtless for the ingress of fresh air, and a huge fireplace for the egress of bad air, and so the air was changing every moment.

Take lessons from them. I don't mean that you shall live all in one room, built as described above, but construct your rooms so that fresh air can constantly come in and stale air can get out, and I am sure the dyspepsias and graveyard coughs, and neuralgias and rheumatisms will be notably less. Parents will not, as a rule, be tottering on the brink of a premature grave; the boys will be robust, ruddy, sturdy fellows; and the girls will be beautiful, because of the roses on their cheeks and the cherries on their lips.

There is another fruitful source of this poisonous carbonic acid gas. It is one of the products of all decaying animal and vegetable matter.

This decay is often considerable about most farm houses. In taking care of vegetables during winter, in carelessly throwing away the refuse portions when they are being prepared for use during summer, as well as in winter, considerable decomposition must result. So with fresh meats in summer. In the best regulated homes meat will taint sometimes in summer, and then the offal from dressing fouls and fish, etc., is often allowed to accumulate about the farm house so as to emit a very offensive odor, thus giving rise to other noxious and unhealthy gasses than the carbonic acid.

The slops from the kitchen, are often thrown around the door, the moisture from which renders more harmful the poisonous gases arising from the decaying animal and vegetable matter. There are not infrequently ponds of water in close proximity to many farm residences, and during the spring and summer a luxuriant growth of vegetation occupies the margins of them, and, in the "dog-days" and afterwards, this vigorous growth dies and decays, and the water becomes stagnant, and it would seem loaded with moist and disease producing gases and nuisances.

Add to the source of bad air from individuals, in poorly ventilated rooms, the vitiated air surrounding the premises from the sources just

mentioned, including others not mentioned, and you are no doubt ready to say it is no wonder that farmers' wives especially, (because they are occupants of the house, and men in the surrounding atmesphere most of the time) wake up in the morning complaining that they have headache, and are no more rested than when they laid down at night, complaining of these and other kindred symptoms that are frequently forerunners of a broken down state of health which renders this life next to miserable.

With a little care and a little labor, judiciously expended, and a very little outlay of money, this bad condition of the air around the farm house may be nearly, if not entirely remedied. It may be summed up in one word, viz.: Cleanliness. Should I advocate "sinks" and drainage for carrying off the slops of the kitchen as well as of the house, it might be urged that such measures would prove too expensive for the average farmer. These are advantages when well constructed and a good supply of water is accessible. This can be done. Let the cook save all the offal arising from preparing and cooking everything in a covered slop bucket, and as soon as it is full, carry it off and give it to the pigs; they are unclean animals anyhow—and let me put in, don't have the pig-pen too close to the house, and it should be cleansed every other day anyhow; let the excrementitions—by this I mean slops containing discharges from the bowels and urine—slops from the house be carried to the privy, as often as may be necessary, and have it cleansed at least twice a week, and use ordinary lime freely as a disinfectant. Cellars will get mouldy and full of bad air, ventilate them thoroughly whenever the weather permits, remove all decayed or decaying matter, of whatever sort it may be, as often as possible, and give it a good coat of white-wash at least four times annually.

As drinking water is sometimes a source of disease, I want to call your attention to cisterns. I think they should be so constructed as to admit considerable fresh air, and yet so as not to be liable to become the recipients of filth from outside. If an epidemic disease prevails in a family, and cannot be accounted for by any other surrounding circumstances, you had better look to the cisterns. They should be built on high ground, so that neither underground nor surface drainage could affect the water, and particularly should they be built into a position where it would be impossible for drainage from a privy to reach them. Hence, you see the necessity of being extremely careful where the excrementitions slops are deposited, lest they should enter the cistern and contaminate the water, and thus produce disease and perhaps death to those who use the water.

Now let me add, if you desire to have health so that you may enjoy your declining years on the farm, if you would cease the stigma from the race, that as we grow older as we prosper, manhood declines, if you would have the boys have big brains as well as vigorous bodies, if you would have the girls useful as well as ornamental, helpmates for the sturdy big brained boys, when they become their wives, and not mere toys, "lillies that toil not neither spin." Give heed to the above hints and supply your families with well ventilated houses, and well ordered surroundings; in short, let them have well prepared food to eat, pure air to breathe and clear, cool, clean water to drink.

MEETING OF THE BOARD AT CARROLLTON.

November 24th, three sessions of the board were held at Carrollton by invitation of its citizens. The notice of this meeting, and of the subsequent one at Mexico, was necessarily very short owing to the accidental presence of Dr. Noah Cressy, V. S., of Connecticut, whose services were secured for these meetings. A rain on the previous Saturday and Sunday of unusual severity prevented the spread of the mail into the farmer's hands. A small meeting at Carrollton was the result, yet an unusually appreciative audience was convened.

The meeting was addressed by the secretary, M. F. Doud, Esq., and by Dr. Cressy.

Dr. Cressy's address was taken by a stanographer at Mexico and will appear in connection with that meeting. Mr. Doud's address will appear in connection with that meeting.

MEETING OF THE BOARD AT MEXICO.

November 25th, the board met at Mexico.

Present—Hon. John Walker, president, Hon. N. J. Coleman, M. F. Doud, Esq., J. A. Potts, Esq., and J. W. Sanborn, secretary of the board, and Dr. Cressy, V. S., of Connecticut.

MORNING SESSION.

President Walker opened this session by stating the offices and purposes of the board. At the conclusion he gave a short talk on "Plows and Plowing" giving evidence in his remarks of rare powers of

observation. So well was the subject presented that the morning hour was occupied by a full and interesting discussion of the plow.

I insert a copy of the proceedings as reported by the Mexico Intelligencer, an unusually full and good report being made by this paper:

As to style of plows he likes a three horse sulky riding plow best. It was set by machinery and could not vary. The depth and slice were all the same. It was said to be heavy, perhaps it was, because it never lets loose. One should drive slow with it. He thought the objections of heavy draft, great difficulty of cost and repair were more than overbalanced by its superior work. He emphasized the even furrow it formed as doing much to prevent washes in hilly ground Many thought the walking plow as good, but speaker thought on account of the liability to carelessness on part of driver it was not. In dragging down corn stalks lay them at right angles to the direction of your furrows. Colter then cuts them in furrow-width lengths so they were neatly turned under. If you should break in the fall don't plow the same ground so deep in the spring. Let the stubble and weed seeds (now burid too deep to plow) remain down there. They for a kind of fertilizer for the roots to feed on. Corn roots put out a new bunch of fibrous roots at this point. Lateral corn roots grow in vertical waves as it were. The tip rises when ground is wet and sinks when hot and dray. Here followed also some interesting statements about the brace or guy roots of corn. How these never form below ground and how we do harm by hilling up corn at the wrong time and defeat our own purposes. When these purposes are covered they cease growing and new ones form at the point above. He recommended winter plowing rather than that in the late fall. Thought it better to plow before frost if possible, but thought washes and impact were worse. He would never plow deeper than six inches for wheat. As to manner of plowing he took narrow "lands" never plowing any across ends until the field was done, then he broke this as a whole, turning it all one way. He thus avoided the sags at the corners of the "lands." Next year he would throw the dirt the other way. Discussion was here invited.

Mr. Alex. Carter wanted to know about closing the "lands" so as to avoid dead furrows?

Speaker took a hand plow and lightly filled the dead furrows. This applies only to hilly land where washes occur. If desired to stop the washes don't throw straw all along furrow, but cut in bunches here and there weighting it down in the middle of the furrows so the water would flow over there and not widen the drain. He would also scatter about these bunches a little manure containing hay seed to stimulate a sod growth on these usually thin places. Draw this out in

frozen time when your wagon tracks will not make new ditches. On hilly lands washings exhaust more than the crop, not so on level lands.

Mr. Edmondson said he plowed narrow twenty step "lands" the entire length of his field throwing dirt to center. At outer edge took a light plow and finished, thus avoiding so much depression. He also drags his field across furrows and as he approached the furrow stepped on drag and drew extra dirt into it.

Prof. Sanborn spoke of beginning at the center of a square or rectangular field throwing dirt to center and thus avoiding dead furrows entirely.

Mr. Schell thought dead furrows often necessary for drainage. Prof. Sanborn replied that so they often drained in Canada, but if these furrows were wanted for this purpose they should conform to the slope of the land and have a system about them. With some remarks about breaking sods, in which the president advocated even furrows rather than laps to suppress the weeds the meeting adjourned for dinner.

AFTERNOON SESSION.

CREAMERIES.

BY EX GOVERNOR COLMAN.

MR. PRESIDENT AND GENTLEMEN—Mr. Walker has told you that I have grown old in the cause of agriculture, and that brings to my mind the fact that it was some twenty-eight years ago on the 6th of last September that I addressed an agricultural audience in the town of Mexico. I don't know that any of those who honored me with their presence at that time are present to-day, but I believe some of their sons and relatives are. And what a contrast now is the city of Mexico and the county of Audrain to what it was at that time. Then the railroad had not reached your town; there were a few scattering hamlets; now here is a magnificent city, with fine public buildings, splendid residences, and everything that betokens enlightenment in your community. Then your county was almost a vast prairie, now it is dotted over with magnificent farm houses, splendid barns, stables, orchards, lawns and everything that betokens the enterprise of an intelligent

population. From that time to this, and even prior to that day, I have been doing what I could to elevate your profession of agriculture, for, like you, I was born on the farm, brought up to hard work all my life, and expect as long as I live to do what I can to advance the interest of agriculture.

I hardly know on what subject to address you this evening. When Mr. Sanborn, the Secretary of the State Board of Agriculture, asked me what subject I would address you on to day, I gave him three, stating that I would address you on the Northern cane industry, the art of making all our own sugar out of the cane, which can be done as successfully as flour can be made from wheat when it is put in the hopper, or as successfully as butter can be made from cream, when it is put in the churn, and the churn is set to working, thereby enabling us if this industry was properly engaged in, to produce in market all our own sugar instead of sending to foreign nations for what we can just as well produce at home; or upon the breeding and management and treatment of horses; or upon the dairy and creamery industry; but really no subject has been assigned to me, and I have not thought upon what subject to address you. Mr. Sanborn suggested that the dairy and creamery industry would be a subject that would be of interest to you. But before entering upon that subject, I wish to say that you are aware, from looking over the agricultural field, that there is a large over-production in some of our branches of farming, especially in wheat production. Our State has been noted for its production of wheat. It has been grown very largely in our State, (not so much in Audrain county as in other counties, because many have turned their attention to stock growing), and there is an over-production of that commodity in this State. Although vast fields of wheat have been planted this year, travel in whatever direction you may you will find them, yet wheat growing in this State will not pay. The day is past when it will pay. Why? Go with me to the north of the Red river valley, a valley of more than one hundred miles in length, go to that magnificent scope of country in the north and see what is going on there in the production of wheat, and you will see you cannot profitably compete with that territory. Why? No other agricultural production flourishes there as that does. It is sown in April, ripens in ninety days, and in five months finds it way to an eastern market. The land can be purchased for about $1.25 an acre, and it yields from 30 to 40 bushels per acre of spring wheat. Spring wheat, as you know, undergoes none of the vicissitudes of winter killing, and all that sort of thing, which winter wheat has to undergo in our State. Large capitalists have united their funds and gone into corporations, or bought large tracts of land them-

selves, and I have seen up there on one farm over thirty steam threshers at work at once, threshing wheat raised on that farm alone. I was going to say 100,000 acres were being turned over for the first time by the plow and being put into wheat. Everything on these farms is carried on with military precision. Everything is fed and the hands are ready to start for the field by 6 o'clock in the morning, and when the 12 o'clock bell rings they go back to dinner, and by 1:30 everybody is back at work. The best reapers, best binders, best threshers, and the best devices of all kinds, regardless of expense, are used there, and there is consequently an over-production of wheat in this country, and there is no limit to the raising of wheat in that far northwest. With their cheap land, and the short season in which their crop matures and is put on its way to the eastern market, I ask you what chance have we on lands that are worth from $50 to $100 per acre, to compete with them in our winter wheat? They are supplying our market and the foreign market. Let us look at the foreign market. The colonies of Great Britian are engaged by the British Government to raise all the wheat that can be produced in India, Australia, and portions of Africa. Land is equally cheap there. The British government encourages the growth of wheat. Every year the extent of country is increasing in which it is sown. Labor by the natives can he obtained for 10 to 12 cents per day by males and for less by females. The natives themselves raise it in a rough sort of manner, although they have crooked sticks and a pair of cows or bulls to scratch over the ground, they manage to sow the wheat, and tramp it out by the cows and bulls, and using sections of trees for wheels, transport it to the market on these rude carts; it is put on board the ships and sent to Liverpool to compete with the wheat we raise in this country.

I had a talk, not a great while ago, with Mr. Garland, who went to Australia a little over a year ago, and I was asking him about that country, and about the extent to which wheat growing is carried on, and how far out he went on the island. I found they raised fully as much wheat there, although south of the equator, as we raise right here, and labor at ten cents a day, all they want. He said he went out some 500 miles on the Island of Australia. I asked him then why he did not go across the Island? He said, "How far do you suppose it is across that Island?" I told him I did not know, I had not studied geography for a long time, but it did not look much more than 500 miles across. He said, "It is 2,500 miles across that Island of Australia, and nearly all of it is adapted to the production of wheat, wool and other agricultural commodities. Look at the scope of country Great Britain has there under her control; look at the encouragement she has given

to the production of wheat to supply the Liverpool market and cut us off! Is it any wonder we are not getting any higher prices for our wheat than we are? Is it not the duty of the farmers to give up that which is unprofitable and engage in that which is profitable? There is not a wheat farmer here or in the State but knows that it is the most exhaustive crop that can be raised on the soil; that the freezing and thawing and the washing rains are all detrimental to the lands which thus lay under the plow; the richest surface soil has been washed off, the soil is exhausted, and I say the sooner we cease the production of wheat and put our lands into some other crop the better it will be. We all know the advantage of a grass crop; we know it is beneficial to the soil; that even if we exhaust our fields by raising corn, oats and other crops by putting them a few years in grass they are restored for the production of other crops, even to that by which it was exhausted. We know the washing does not go on; that the fields are carpeted; that there is no expense in the cultivation; that the animals which feed upon them do their own harvesting; it brings better returns than any other crop we have; also that grass is the king crop in the country. We used to say cotton was king but the day is past, and grass is the most valuable crop that can be raised. The farmer is a wise farmer who puts most of his land in this king of all crops.

So far as our own State is concerned, in speaking of this dairy business, we have surpassing advantages over the Northern States. We have in the first place a much longer season of grazing than those people in the North have, and look at the large advantage it is in that respect. If you go to New York, Massachusetts, Virginia, Wisconsin and Iowa, you will find, even there, gentlemen, with the long winters, that the wealthiest farmers they have are dairymen. You will see that the dairymen have the finest residences and the best filled barns; go in the banks in their neighborhood and you will find they have the most plethoric bank accounts. They have grown rich in that business. You cannot point to a single section of this country where it has been carried on for a long period of years, that those who have pursued that business are not the wealthiest men in the country, notwithstanding the long and severe winter, notwithstanding, as I learned last year when I visited the North, that those men there were buying Missouri and Kansas corn, paying $1 per bushel and feeding it to their cows, and still getting rich. I found them buying cotton seed meal and feeding it to their stock and still making money at it, with all the addition of freight added, and still making money.

We can turn our cows out in the spring a month earlier than they can there. We go through the winter here much better than there,

because the thermometer gets down there to thirty degrees below zero; then when butter commands the highest price, which is in winter, their occupation is gone. They don't pretend to carry on the dairy business in the winter; yet these gentlemen grow rich. We can keep our cows in the timber a month later than in the North. See the advantage we have in this respect. Two months, at least, in the year advantage over them, which is, taking the dairy season through, 33.3 per cent. in favor of Missouri. We have better grass here than they have there. I have been all through the Kentucky blue grass region and I have been all over this State, gentlemen, and I tell you that if either of the States are left behind in the prolificness of blue grass, in its production, it is the State of Kentucky that takes the second place to Missouri. I have never seen larger blue grass crops produced in any other section of the United States than in our State. We have, then, every advantage for the dairy business. We have the grass, the long summer season, cheap corn, short winters, when we can make with very little trouble and care our butter and obtain five or ten cents per pound more than those in the North do. If the people in the North get rich in the dairy business why cannot the people of Missouri follow their example. I want to know why they will still cling to their wheat?

Now of late years we have a decided advantage, here, in another respect, in reference to making our butter. You have heard of the creamery system; it is new here, the oldest creamery being about 12 years old. The first one started in the west started in Delaware county, Iowa. They gather the cream for the creamery, leaving the milk at home to be fed while sweet to the calves. They sell the cream, not the milk. Of course, in a creamery, you have every facility for making the best butter; everything is done by machinery, by iron force instead of human force. Some of you know what it is to make butter by elbow work like this, (speaker making the motion of churning) and sometimes you have thought the old boy himself had got into the cream. You all know what it is to churn cream when it is not just right, when something is wrong. Now it is all done by an engine no larger than that stove. This valley is as especially adapted for this purpose as was Iowa. All who have looked at the market reports know that creamery butter commands several cents more per pound than dairy butter. Why? Because they have their room for holding the butter in precisely the right temperature. They have learned what temperature it should be to make the best butter. They put it in large vats surrounded by iron tubes in which warm water or ice cold water can be put, using whichever is needed to produce the best butter. They have

an ice room, and the butter is all worked, salted, packed and stored away in this room, so as to be sold in the heated summer time to Philadelphia or New York, where it is at once put into a refrigerator room and sold for such prices as farmer's butter could not be sold. This is the advantage of a creamery. Again an expert makes the butter and keeps everything in perfect order, and in that way the butter is put in the market and obtains the highest price.

What did that little establishment in Iowa do? There are over thirty creameries now in Delaware county, Iowa. The farmers who sold cream have lots of money. They did not have to run any risk of having the wheat crop injured, did not have to wait till the end of the season to pay their hands, or to pay off any of their debt; it was a cash transaction. It spread like the measles all over the county, and the adjoining counties got the contagion, and there are now over 700 creameries in that State. The contagion spread into the State of Missouri, and we now have some 50 creameries in the State of Missouri. A good many men kick against it, I know. One Iowa gentleman called at my office, and he said: "The first year this matter came round I said I would have nothing to do with it; I wanted the cream for my calves; but a neighbor having about the same farm, same number of hired men, same number of calves, concluded he would sell his cream. He sold cream, I let my calves suck the cows; when the fall came he had over $1,000 in the bank, and his calves were as good as mine, and I had to go to work and sell some of my stock to pay my hands, and I have since then been selling my cream too."

The cream is simply the fat of the milk; everything that goes to make bone is retained in the milk, and the calf does better, and the cows do better than when having the calves tugging at them.

No branch of farming pays better than this. We are not succeeding as well as we ought to for one or two simple reasons, to wit: 1st. You cannot run a flour mill unless you get wheat enough to make the flour; you cannot run a saw mill here because you have not the timber to supply it; you cannot run a creamery unless you have got farmers raising cows who are willing to have them milked and furnish the cream to the creamery. You can starve a creamery to death as well as anything else. One of the objections in the State is that some way we feel above milking, and our boys feel above milking. We are not willing to get down to it as these Yankees do.

By this creamery system you relieve your wives of all the burdens of tending the milk, turning the butter and working it over, salting and packing it, and making complete slaves of yourselves or of your hired help, if you are so fortunate as to get any worth anything. By

the creamery system all this is avoided. There are tin cans with a glass run through them that shows how many inches of cream there are. They pay so many cents an inch for the cream, and if you have eight inches of cream it represents eight pounds of butter. The creamers come to your house every day in summer to see how many inches of cream you have, and they give you credit every day for what they get. This credit shows how much they have received from you, and when the month runs around you have sold so many pounds of butter or so many inches of cream, which ever you choose to call it. You know the difficulty you labor under in making butter at home. You have no room where you can keep all the dust out, or gauze to keep the flies out. Perhaps you have to keep it in the kitchen, where all the odors of the cooking stove, onions, turnips, meats and vegetables will all go right to it. You know how butter and milk partake of odors, they absorb them. If you sweep the house, the dust will creep through the cracks, and the flies and gnats will get to it unless you have an independent room for it. And even if you keep it down cellar it will be contaminated by decaying vegetables. The milk is too cold, or it is too hot and has to be watered, and consequently our butter is white and flavored with everything we cook around the house, and of course will not equal that of the creamery butter where they have the refrigerator room and have studied this thing scientifically for years, so now they know just how to regulate the cream so as to produce butter of the highest kind. The cream without any labor or exertion sells for more than the butter which your wife makes; to use a slang phrase, you can put that in your pipe and smoke it. There is no doubt about it.

Now the trouble in the way in this State is the milking question. You don't want to build a creamery in this town if you are going to let a woman get on one side of your cow and a calf on the other to see which will beat, and sometimes a boy on the fence with a hickory stick, and when he thinks the calf has got enough, he commences to whip it to drive it away, and if the old cow does not behave herself, he uses the hickory on her. That system will not pay here nor anywhere else.

You ought to have shelter of some kind for your cows. Up North they have stables that can be darkened in fly time. You don't like to go out to milk in fly time and have the old cows kicking and flying their tails around in your face, or you don't like to go out in the mud and milk, or in the rain, or when the wind is blowing hard; you don't like any of that sort of thing, but with the majority of farmers of Missouri that is the way it is done. You want dry stables that will keep

out the rains, and snows, and flies, if necessary, and be able to feed those cows in summer and in winter where the milkmaid and the milkhand can sing at their work. It is just as much expected by the hired hand in the North that he is going to milk eight or ten cows as that he is going to get his pay. We have to go into some sort of business in which we can make money. Of course the Northern men don't like it. I tell you it raises your land up to the value of theirs of $100 or more an acre, because you compete with them. The butter that was awarded the premium at the Centennial was made in Delaware county, Iowa. People in the East were astonished that as good butter could be made west of the Mississippi as in their own country. At the World's Exposition that same butter went over and entered in competition for the premium and received the second premium there. Queen Victoria tasted and smelt that butter, and said she could not see but that it was as good as that made on her own soil. We can make just as good here as in any land the sun shines on. We will have to pay more attention to the selection of our cows for milking purposes. If you let your calves suck the cows you are not going to get the best milkers. When I was visiting the dairy region last summer I was astonished to find the best milkers were what we call scrubby animals. They told me they kept these animals for generations—kept their heifer calves, and the milking qualities of these grew until they run the patent buckets over. Whenever they found a cow that was giving much milk they kept her with care, and her calves also, and encouraged the milking qualities until all the stock they keep, now, are large and abundant milkers. They are as regular in milking their cows as the hands on the dial. Now we have to select our best cows and keep them, and in that way we can cope with the world. Take the little Jerseys, for butter no breed stands higher. On the Island of Jersey these little cows have been kept for years, and weeded out, sold and killed, the best ones kept, and now look at the remarkable butter qualities which these possess, because their milking properties have been increased in every possible way from generation to generation.

Look at the Holstein stock, a Dutch selection. Look at the high price which they command because their milking qualities have been developed, being not only great milkers, but excellent animals for beef, cheese, etc., and having an iron constitution and those qualities that recommend them; and it is all because these qualities have been developed properly. We must do the same with our own animals, for a few bad cows will destroy the profits of the whole herd.

Weed out the poor animals, feed your cows liberally on sorghum seed, corn, etc. during the drouths in summer, and have plenty of fodder for them in winter, and in that way you will keep up the flow of milk. Have comfortable stables and no branch of farming will pay you so well and increase you bank accounts so largely as dairy farming. But I know I am taking up too much of your time. There is a gentleman here who will talk to you on another subject. I will be only too happy to hear that at some future time you have got right here in this place a creamery. Turn your attention to the dairy business. It is manufacturing your grass into gilt-edged butter. We all hear about election time that we want to protect our home industries, and I am glad to know there is such a feeling right here. The only way to build up this town is to encourage manufactories; you want a creamery here; you ought to sell a hundred thousand dollars worth of cream every year; you want a sorghum factory, notwithstanding the low price of sorghum at this time; you want to make your own sugar just as they do at Champaigne, Ill.; Hutchison and Sterling Kan., and Cape May, N. J. I say you want to encourage manufactories of this kind in your town, and I believe Mexico will some time become the most enterprising town in Missouri.

Questions were then asked Governor Colman, which were answered as follows:

Maj. Lawder—How many cows can one man milk and care for?

A. In the East where milking is the principal occupation, a man will milk and attend to thirty cows a day.

I. N. Hathaway—Does our system of supplying water to stock work to the advantage or disadvantage of a dairy? Is it as conducive to good dairy products as in other States?

A. Yes, sir; any good water, whether pond, lake, flowing water or well water; ponds should not be placed so as to receive the wash from stables.

Mr. Keith—What would you feed the calves to supply the cream that has been taken off the milk?

A. Linseed meal and corn meal.

Prof. Sanborn—Boil flaxseed meal and add it to the milk and feed it to the calf at an early age; boiling obviates scouring; by this process you can save the milk and have just as good a calf; I say our calves raised on skim milk may be just as good as our neighbor's calves that have all the cream.

Gov. Colman—A cow will produce $50 worth of cream and raise a calf also. Some produce as high as $75 worth of cream a head, but

$30, $40 and $45 a head is an ordinary run. This is the sale of the cream without any labor.

Mr. Harrington—From my experience of 18 years, I find the average pond is more mud than water. You cannot expect to have good, pure cream from cows that drink water from ponds where the hogs wallow, but if we would only take care of our ponds we can have as good water as in Iowa. There is no person, that is not too shiftless, but can make a good pond and protect it properly, and have pure water. You cannot expect to make good cream or good butter out of impure water.

Gov. Colman—If there is anything you should have in abundance, it is pure water. If you have not running water, you should have ponds. There is no farm that could not have its half dozen ponds, and all should be well stocked with fish, and there is nothing that is more profitable. You can sell your fish right here in town. Any of you can get fish from St. Louis to stock your pond with, and if you do not do it you are standing in your own light. In addition to this, you will have the ice—just what is needed. We want our ice houses, and from these ponds we can obtain all our ice. If you want to make butter at home, you should partition off your ice house and make room to keep your butter in. Those who have not ponds should supply yourselves with them.

Mr. Hathaway—There are difficulties under our system of farming, that will prevent us from making as good butter as is made in Iowa and other places that have been mentioned. Some of these difficulties grow out of our want of pure water, and until our system of supplying water is changed, a creamery cannot be made of any advantage. Many of our methods need revolutionizing, and we have not the climate to produce as good butter as elsewhere. A member of my family made butter under the Cooley system, and it was exhibited at our county fair while fresh, and took the first premium. The same butter was kept two years, and again exhibited, and again took the first premium. The one who made that butter says, there are things here to detract from the qualities of butter. He says there are some of the properties of our grasses that will not equal the grasses in the east; hence, he says we cannot manufacture the same quality of butter as they. I am not willing to believe that we cannot make as good butter here as there. There is something in our grass that will produce more fat and less butter. I am in favor of creameries, and would like to see the country revolutionized in the manufacture of butter.

Gov. Colman—I think the gentleman is a little inconsistent when he says our grass is not adapted to the production of good butter, yet

he makes butter that will take the premium after it has been kept two years.

Prof. Sanborn—I want to say, the worst butter I have ever eaten was made in this State. It rests with the people here to say why it is so. Our indifference, not incapacity nor bad surroundings, is the cause.

Gov. Colman—I want to say as an off-set to that, that the best butter I have ever eaten was made in this State.

If there are any of you who think of going into the dairy business, I would advise you to visit Mr. Irwin, who has a most excellent farm near Fulton, and who knows how to feed his stock as well as any man I have ever seen. He knew no more about the dairy business ten or fifteen years ago than a school boy, and by accident we called a meeting of this same Board in Fulton, and I spoke there upon the dairy business, (of course we were not as far advanced as we are now,) and I gave him the dairy fever, and he is now as far above me as the sun is above the earth. He has grown rich, and has the best arrangements for a dairy of any man I know.

Mr. Sanborn said he believed that we can, if we will, and that by all means we should make more and better butter.

After an address by Mr. Sanborn, M. Fairchilds Doud, delivered a very interesting talk as follows:

MR. CHAIRMAN AND GENTLEMEN—You have listened to remarks from gentlemen preceding me, who have been in the lecture field more years than I have lived, and of course you will be generous enough not to expect from me what you have received from them; if you do, you will undoubtedly be disappointed. I have no set speech to make; I simply wish to call your attention to a few facts that will not only bear the investigation of those present, but of the world at large. The gentleman preceding me has talked very largely on agricultural science. He has mentioned scientific farm, we are led to ask, what is science when applied to agriculture? When we figure it out it amounts to but one thing, plain figures. It is simply figuring the profit in the different branches of agriculture, and when we have that, we have the scientific part of it.

There are some of us, no doubt, I did for one, think that some day we would master this subject of agriculture, but when our learned friend comes before us and says he has been a student of agriculture all his life, and would rather now set out to master any three professions than this one of agriculture, he almost discourages us, and we think we had better turn back and try something else. And when this is stimulated by the fact that the farmers of this country, let me modify that and say, the men who are tilling the soil, are paying the heaviest portion of

the taxes that are paid, both direct and indirect, and are receiving less than one per cent. of the disbursements back for their direct benefit of that money, we are still inclined to think perhaps we have taken the wrong road.

If the lawyers go to the capital and say, they want $16,000 to pay for printing the decisions of the Supreme Court they get it, yet when we go up there and ask for $18,000 proposed to be used on our agricultural farm, to build a barn and other improvements, that we may better educate our children in agricultural science, the Senate puts its foot upon it and lays it on the table and says we will keep it there two years; but they will turn around and say to us, we want so many thousand dollars, and you must pay a certain per cent. of that; it is trying indeed.

When we ask ourselves, what science is when applied to agriculture, we have a problem that will bear the closest investigation. We have something that perhaps is receiving more attention to-day than any known profession. Our secretary has told you that farming did not pay, figuring your wages at $1.00 per day, and seemed to feel sure that every one present would verify that statement. (Prof. Sanborn means of course wheat and corn farming as carried on). Perhaps he is right, yet he may be opposed by one-half of this audience. Last winter I received a paper from the secretary—a blank so to speak—asking questions, and leaving a blank for me to answer the questions. The last question on that paper was these words: What per cent. will the farm pay in your county, charging your time to the farm at $1.00 per day? I figured for six hours by the clock on that question, and to figure out a cent of profit for the farmer, would be as impossible as to take that stove and walk off with it on my back. Figure it which ever way I might; I would keep cutting down the price of our land, and the price of horses, and I cut the price of the machinery down to the wholesale price, and figured the interest on the money at the very lowest interest that you could borrow money—3 per cent.—and yet I brought myself out in debt every time. I tore the blank up and did not send it at all. Now what is the matter? It is right here; we have no system. I say we have no system. Why if you would go and say that to a man he would take it as a grand insult. Suppose you ask one of your merchants if he kept a set of books, and he said no, and you asked him why he did not, and he said, if I buy anything for one dollar and sell it for two, I know I am not losing anything; I know what I am doing. You would think you had either struck a crank, or a fool. I venture to say that you have not that kind of a merchant in your city. But if I go out and ask a farmer if he keeps a set of books, he says, no. How

do you know you are making anything at all? He says, I am trying to sell things for a little more than they cost me. How do you know what it has cost you to raise that steer? Unless you know what that bullock has cost you to produce it, you don't know what to sell it for. Unless you know what a bushel of wheat, or corn, or rye, or in fact anything that is produced from the soil has cost you, you don't know what to sell it for. Then there might be many things more profitable than those that you are raising. Why don't you raise those things? Because you have not posted yourselves. That was plainly illustrated here to-day, from the fact that men asked questions that supreme wisdom could hardly answer, but expected our veterinary surgeon to answer them. If they had been reading our papers and agricultural reports, they would have known that those very diseases had been baffling the skill of our best surgeons all over the country. Unless, gentlemen, we come down and have some system with our farming, we can never obtain the first principle of practical agriculture.

Our chairman spoke to you about the fine stock of this country, I wish merely to call your attention to that very briefly, as I want to bring it in in connection with something else. It would be taking too much time to give you a history of the fine stock in this country, because, if you don't know that, you can find it in books much quicker than I could tell it to you. Here is a very complete picture of a stock farm in the west of about 15 years ago, (showing picture), and here is the stock exchange at Kansas City. (Exhibiting picture of exchange taken 1868). To-day we have as fine a stock exchange as you ever visited in your life. You may think that is very broad and sweeping, yet it is a fact, our horse and mule market of Kansas City to-day is the greatest institution of the kind on the globe—the sale of these stables exceed any other market in the world. Now what has developed these things? Has it been the long horns of the west, or has it been the progress that has been made by chopping those horns off by degrees? Where a few thousands of dollars used to exchange hands a month, now a few millions exchange hands every month.

I presume the value of the fine stock of this State (I don't mean when I say the value, the assumed value, for that don't mean anything in this State, only to get what they can in way of taxes), the actual value exceeds any other industry except it be the railroad property.

I wish to speak of the fat stock shows. You ask what value are the fat stock shows to the farmers? They are of the same value to us as this board of agriculture would be if it had the right and means to be. We are a cripple, you know. For instance, two years ago this fall I was at the Chicago fat stock show. The Herefords competed for

premiums—I know there are some short-horn breeders here, and perhaps some Hereford breeders. They competed and, using a slang phrase, were scooped on every hand, the short-horns capturing most of these premiums; but those Herefords walked off with the sweepstakes premium on dressed carcasses, because the quality of beef was better than anything butchered by the short-horn men. This led to bad blood on the part of some of them. Each breeder of these select classes of cattle contended that his was the best. Each one was trying to see if he could not outdo the other. Some time before that the importation of the Polled Angus cattle began, but up to that time none of them had been butchered. This fall at the Kansas City fat stock show was there a cow called a Polled Angus cow—but I am a little too fast for my story. Sometime in the summer we published an article, that read like this: "On the 19th day of June (I believe it was) the Leonards and Walter C. Weedon made a sale of twenty-six Angus bulls, at Denver, that averaged $540 per head. One of the noted features of the sale was that the most bulls sold to any one party, or parties, were sold to breeders of Hereford cattle. Some of the breeders took such exceptions to that little article that they withdrew their patronage from our paper. You see what we have to contend with. That Hereford man took exceptions to what we said, yet that Polled Angus cow, when she was butchered, took the sweepstakes premium on dressed carcass. I made up my mind I would have a piece of that Polled Angus cow, if I had to steal it. It was selling at $1 per pound, but that was less than it sold for before it was butchered, and I bought two pounds and a quarter of the round steak. I had it cooked. There was not as much fat, apparently, as on that piece of paper, and it fried out a skillet full of tallow, besides cooking itself. Now is that science applicable to agriculture? It is something that is beneficial to you and to me and to every man engaged in stock raising, no matter what our cattle prejudices are. There was another premium down there. It was a cross between a Hereford and a Polled Angus. It was practically a thoroughbred, but not eligible to the register. It was competing with several short-horns. They were about to tie the ribbon on that cow, and I believe it was on account of the protest of a short-horn man that it was not done, and the cow was taken out. I am not advocating the Polled Angus breed, but these are facts worthy the consideration of every good citizen.

I wish to speak briefly of the diseases of stock in this country. It is absorbing the interest of the people to-day more than anything else. We have pleuro pneumonia, and all sorts of plagues coming up against us. In 1883 it was complained that some of our cattle were sent to

Europe that had pleuro-pneumonia. Our cattle arrive there and are put in dock and stand up in a stall by themselves, and an inspector comes there, and if he finds a single one diseased he condemns it and it is not used for meat. After they pass the inspector the first time, they are taken down and slaughtered and the lungs of these animals laid out to themselves, and the second inspector comes along and hangs these lungs up, runs them through his hands, and if there is anything that does not belong there he detects it, and the animal is condemned and not used for meat. In 1883, nine of our steers which went from this country, five or seven from Missouri out of that nine, were condemned after being butchered. Yet, we are not provided with the first inspector in this State. Now, that is the condition we are in. If a disease should break out here to day, there is no power in this board, or in this State, to help you one iota. Now, this legislature that convenes a little over a month from to day, should pass laws for the protection of our stock, if we demand it. If we pay taxes in this State we have a right to demand it, and we will demand it. Last winter at Kansas City, one of our butchers, who had been doing such a big trade that he had to have five or six men to help him, was found with diseased steers in his pen and was arrested, and the greatest penalty that could be placed upon him was a fine of $100. The court said, "I wish I could send you to the penitentiary." That gentleman walked into the Times office, two or three days afterwards, and told them they had ruined his business. The Times took the head of one of those diseased bullocks, that had been butchered in his pen, and had it engraved, electrotyped and printed in the Times, and he told the times they had ruined his business. He said, "If I was the Lord I could not sell a quarter of beef in this city." Yet, we are compelled to take those things. Now the board is powerless to do anything. If we go and demand these laws of the legislature, it has been said the very ones that oppose us are the farmer's representatives which you send there. When we put our bill before the House the last legislature, they said do not ask us to vote on it, because we shall vote against it; but when they come to cast their vote they dare not put themselves on record against that bill, but the Senate never did vote on it. I have just called your attention to these facts as briefly as possible. If you do your duty, if we all do our duty, this winter this board will be empowered as a sanitary commission, so to speak, so that if we have those diseases in the State we can quarantine them, and can quarantine diseased cattle from other States. If we do not, we are going to have these diseases run in on us from Kansas and adjoining States. Our stock yards in Kansas City to-day are in such a

condition that men come there and say they are afraid to purchase, because we have not the first sanitary protection there, and they may take some disease away that will wipe out everything they have on their farm. I hope I have not wearied your patience, and thank you for the marked attention you have given me.

PRACTICAL AGRICULTURE AND THE INTEREST MANIFESTED IN IT BY THE PEOPLE OF MISSOURI.

BY M. FAIRCHILDS DOUD.

If those most able, and who should be as much interested in it as myself, will only take the subject matter in hand and give it earnest work, it will be but a short time before there will be a great revolution in the agriculture of the State in its broad results.

Agriculture embraces all that pertains to the making of the soil and obtaining of sustenance and clothing therefrom, whether it be from the cereal grains, or from cattle, sheep, swine, poultry, the horse, pasturage, hay, the feeding and fattening of animals, the application of different kinds of manure, or the dairy, etc.; in fact, nothing that is produced by the farm, for the practical use of the farmer, should be excluded. But the most important of all, is for the farmers of Missouri to become more aggressive in agricultural pursuits. They are as dormant in this State as the church "back-slider." The first thing to be done is to create an interest among *farmers* in this great work. Then the question arises, "what shall be done to create this interest?" For the purpose of creating more of an interest and advancing the progress of agriculture in the State, a State Board of Agriculture has been created, and given enough funds to keep alive—but not in a healthy condition. Why are the farmers so backward? Why do they not move forward and place Missouri at the head of the great agricultural districts comprised in the Mississippi Valley, where she belongs?

Agriculture is the wealth of the Nation, and agriculture pays over sixty-six per centum of the entire taxes of this State. But we are

LEAVING OUR TEXT.

What is practical agriculture? It is the scientific part of farming. Then, the first question asked by every farmer is, "what is science, when applied to agriculture?" If I understand the question and am allowed to answer, I shall say, "to know the cost of production, what it is necessary to produce, and what are the best paying commodities to produce." To know this, it is necessary for the farmer to, first, know what is needed to produce an ear of corn; second, to know if his soil contains the matters needed, and if it does not, then he should know at once that he must supply the deficient material or his crop of corn will be a failure, and the same result with all other crops will occur. The farmer should know the kind of soil which is adapted to the grain planted. This would be very expensive for a farmer, perhaps, but if the Missouri State Board of Agriculture is empowered with proper authority, agriculture in Missouri would soon be placed upon a higher plane, and at a very moderate expense. While the farmers of Missouri are paying the biggest half of the taxes and producing all the natural subsistence for the people of the State, no laws are enacted for the protection of their stock, and when any of our legislators' attention is called to it they say the farmers do not ask it, and why should they be interested. Why are business men interested in agriculture enough to create a demand for our monthly crop reports. None can be more interested in practical agriculture than the business man himself, and the farmers of Missouri should not only ask proper legislation in their behalf, but demand it. The truth is, Mr. Secretary, the farmers do demand such legislation, but the legislature is mostly composed of men who know very little about farming, and fear if they appropriate to much money for the advancement of agriculture they will be cut short in their needed demands. Let the farmers of Missouri unite, and demand of the coming legislature such laws as will render protection to their domestic animals, advance agriculture as it should be, that in the State may be aided. In my judgment, the Board of Agriculture should not only be empowered to protect the domestic animals of the State from contagious diseases but should be provided with sufficient funds to employ the services of a competent man as secretary, who should be empowered, through the authority vested in the board, to print monthly crop reports, beginning with the month of April and ending with the month of November. The crop reports are of the highest commercial value, both to the man of business and to the farmer, hence their importance. At the close of the year a summary of all the monthly reports should be compiled in one volume for

the benefit of farmers. This would do much toward practical advancement of agriculture. There are many things of importance that might be woven into this article, but I promised to be brief. In conclusion, however, allow me to say that the farmers of Missouri are more than willing to take advantage of every device that tends to their interest, and likely to bear fruit for them.

COMPARATIVE RELATION OF MAN AND ANIMALS.

BY NOAH CRESSY, M. D., V. S. PH. D., HARTFORD, CONN.

Mr. President and Gentlemen:

That a general knowledge of the mechanism and physiology of the animal body is absolutely necessary for the discrimination of disease, no one will doubt.

The location and phenomena of symptoms cannot be accurately interpreted without an intimate acquaintance with the structure and functions of the internal organs. A case of acute nephritis, therefore, might easily be mistaken for an inflammation of other abdominal viscera. All these maladies wonld appear mysterious, and to the uneducated eye, essentially the same. In fact those characteristic symptoms of specific and organic disease would have no meaning to one not familiar with the general organism.

If the physician has all the necessary facts in relation to the anatomy and pathology of the malady in question, the therapeutical indications are easy of conception, and this treatment, therefore, is practically the result of a scientific conclusion. But the quack, whose scanty knowledge of disease rarely enables him to distinguish one ailment from another, can never give an intelligent reason why he uses a certain remedy, nor tell what effect it may produce. Hence a system of practice, either in human or veterinary medicine, which is not based upon the established principles of biological science, is fallacious in theory, and dangerous in its consequences.

In fact much quackery would cease, and many erroneous notions concerning the nature and seat of disease must inevitably be dispelled by the general diffusion of anatomical knowledge,for,nowhere are faulty methods of reasoning more frequently met with than in the practice of the healing art; and this is largely due to the system of

education by whice young men have attempted to fit themselves for this calling. Thus the difference between a true and empirical method of curing disease depends wholly upon the degree of intelligence which the practitioner may possess.

The crude notions of disease, so frequently exemplified in the practice of the uneducated farrier, are almost invariably the gift of a fertile imagination, rather than the result of any pathological investigations. It therefore behooves us in the study of the veterinary art, to lay broad the foundation of knowledge, and thus inquire into the real nature and cause of the malady, before searching the materia medica for a cure. This will require a general knowledge of the structure and of the anatomical relations of parts before any facts in a pathological point of view, can have the slightest bearing on the question of treatment. For instance, how can a farrier diagnose and successfully treat a case of pneumonia, in its various stages, who has no knowlege of the real structure of the lungs, nor of the circulation of the blood. Hence, the importance of the study of anatomy and physiology of domestic animals.

The relation of man to the higher mammalia, which has caused so much speculation among philosophers and naturalists on certain zoological affinities, is especially interesting and instructive in an anatomical point of view. The skeletal framework and internal organization of our domestic animals are morphologically identical with the structure of the human body, and thus subserve the same purpose in animal economy. The limbs are similar in mechanical design, are made up of the same kind of bones and joints, and are therefore subject to analogous diseases from exposure and accidents. Thus the necessity of more carefully studying the structure of animals, that we may better understand the nature and situation of the difficulty in every creature that we are called upon to relieve. This leads us, therefore, very naturally to inquire into the comparative, relations of the joints and parts of animals to those of man, which are not well understood, especially by those most interested in the care of stock. This want of knowledge has many times led to fallacious conclusions, which have served as a barrier in the pathway of veterinary progress. But the popular demand for those facts which a knowledge of anatomy alone can give are propitious omens in the canopy of our agricultural schools, and thus indicate the future trend of the practical education of farmers.

ANATOMY OF BONES AND JOINTS.

Though all the vertebrate animals are built upon the same general plan of structure, yet we find a modification of this plan in the four great classes known as fishes, reptiles, birds, and mammals, to fit them for their several spheres in life. But the special details of structure on which genera are founded are well illustrated by the variety of forms in the limbs of quadrupeds.

All animals which crop their forage from the ground, and thus use the legs simply as pedestals, have no necessity for that power of rotation in the fore arm, which man and carnivorous animals possess in such a marked degree, as organs of prehension. The radius and ulna, therefore, have grown together, in accordance with nature's law of economy and strength, both in the horse and all animals that chew their cud. This anatomical fact has enabled the geologist to predict the herbivorous character of a fossil species from a single bone. But in the hog these bones are not united, yet they are so closely adjusted that the power of pronation and supernation has be lost.

RINGBONE, SPLINT AND SPAVIN.

An osseous deposit around the pastern joint is known as ringbone. It greatly interferes with the motion of the joint, and often causes a severe form of lameness. The disease may arise in various ways, but it is usually the result of an inflammation of the extremities of the bones, and of their articulating surfaces, either from direct injuries or a strain. Synovitis and periostitis are therefore the inevitable result of an injured joint. Bony matter is deposited upon the inflamed surface, and thus a complete osseous union or an anchylosis of the joint at last occurs. This new formation gives rise to the enlargement, a ringbone, which by all efforts to cure can never be removed, Consequently a cured ringbone is where the upper and lower pasterns have grown together, and where there is no motion of the joint, and if the bunch is not large, all lameness will cease.

Hence, the only rational method of cure consists in hastening the bony union, and this can best be done by the free use of the blister and the firing iron. But there are many vague notions about this disease that have long been received by the uneducated farrier, as an explanation of the difficulty. "Leakage of the joint" is now the more commonly accepted opinion among horsemen. While certain quacks in want of a nice little surgical job, claim that "ringbone is caused by a bladder, situated behind the joint that feeds it," and therefore, its im-

mediate extraction is the only curative means to be employed. Such fallacies need only to be pointed out to be discarded, and with the true anatomical explanation given, these empirical methods must cease.

Another form of morbid bony growth, frequently met with, both on the forward legs and behind, and one that often causes severe lameness for a short time, is the union of the splint with the cannon bone. This trouble usually arises from an injury, which sets up a periosteal inflammation about the parts, when an osseous callous results, thus cementing the two bones together. This having been accomplished, either by nature alone or by the aid of the surgeon's art, the animal ceases to limp, and the case is permanently cured. The bunch will gradually recede in size, and sometimes entirely disappear, so that it can be neither seen nor felt, but the two bones are firmly united and can never be separated. The claim, therefore, that "a splint can be taken off" and thus leave the leg natural again is a fallacy, as a moment's inspection of the bone afterwards would show, yet the horse in reality none the less valuable.

The cannon bone of ruminants furnish another very interesting fact, and one that is of equal importance to the paleontologist in determining the character of a fossil animal. This round bone of the leg, unlike any other in the animal kingdom, contains two marrow cavities which result from the union of the third and fourth metacarpal bones in the anterior extremity, and of the metatarsals behind. This is indicated by the double articulation which it makes with the two phalangial rows contained in the claws of the divided hoof. In the embryonic stages the cannon bone readily divides into its two component parts, but at birth they cannot be separated in any of the ruminating animals. In swine, however, these two corresponding bones do not unite, though always in close contract with each other.

Accordingly, the forward foot of the hog represents a human hand, with the exception of a thumb. The two toes, therefore, which these animals and all others with a divided hoof walk upon, correspond to our middle and ring fingers, and the bones in the dew-claws represent the index and little finger.

In the horse, however, the cannon bone is single, and has but one toe, which represents the middle phalangial row of the human hand. Morphologically, the nail is the hoof, and the three bones of the finger are known by the veterinarian as the coffin, coronet and pastern. The larger knuckle of the hand, therefore, is the fetter-lock joint of the horse, and the wrist the forward knee. The elbow is reprosented by that projecting point on the back of the leg close to the chest where "shoe-balls" occur.

The hind leg has also some peculiarities in its mechanism that be

come very interesting points in the treatment of disease. The hock-joint, which is delicately constructed, and so frequently the seat of lameness from a sprain, answers in an anatomical point of view to the instep of man, though its relative position to the ground has been very much changed. In view therefore, of the comparative relations of limbs, we shall find, much to the surprise of the casual observer, that the stifle-joint corresponds, in every particular, with the human knee, and consequently the stifle-bone, so often dislocated by accident, is the homologue of the patella or knee-pan. The necessity, therefore, of a thorough knowledge of these anatomical facts to aid one in the diagnosis and proper treatment of those obscure joint difficulties, is now apparent to all, and its importance cannot be over-estimated in behalf of a scientific practice in this department of the healing art.

But this is not the case with spavin, which consists in the growing of two or more of the tarsal bones together. The hock, before described, is a very delicately constructed joint, made up of six bones, and bound together by various ligaments. Situated at the posterior angle of the hind leg, which does most of the work in drawing, it is therefore frequently subject to severe strains, causing immediate lameness.

A general inflamation follows, succeeded by synovitis, periostitis, and anchylosis of one or more of those small joints. The cure, therefore, for spavin, like all other allied forms of disease, consists in hastening the bony union of the parts involved, by the use of the hot iron, blisters and liniments. It may at first be confined to the scaphoid and large cuneiform, and thus end with their ossiffic union, but other bones may become involved, and ultimately it may extend to the whole joint, often causing an immense enlargement of the hock.

THE "CHEST-FOUNDER."—SO CALLED.

This term is a misnomer as applied to the seat of disease in the forward leg. The trouble is invariably in the feet, and the symptoms by which it can be thus recognized are unmistakable. The horse "points" the foot, or stands with the heel of the shoe raised from the ground, always steps short, and in Scotland this gait is known as "groggy lameness."

After some time standing, the heel becomes contracted, grows down long, from want of wear, so that the hoof looks like a collar-box, being nearly as high behind as in front, and smaller than the other foot. There is heat and also tenderness on pressure in the hollow of the heel.

The sunken condition of the chest is a fallacious symptom, inasmuch as the two anterior thoracic muscles have shrunken in size, or atrophied merely from want of use in throwing the leg forward naturally, instead of taking those short steps, as compelled to, on account of this morbid condition of the navicular joint. Hence the very significant appellation, *naviculur arthritis,* for the trouble in question.

The degree of lameness varies greatly with the condition of the foot. When the foot is dry, and upon a dry hard road, the horse is sure to limp, and always starts off lame; but in soft muddy going, or upon a sandy road, after soaking the foot, the same animal might not for miles take a lame step. Hence the necessity of special attention to the feet in cases of this kind.

Any treatment therefore directed to the supposed trouble in the chest, by way of seatons blisters, or even liniment, only evinces the mistaken notion of the practitioner, and thus clearly sets forth another popular fallacy, which has long held sway among the majority of horsemen in this country.

ACUTE LAMINITIS IN THE HORSE.

Another trouble in the foot, that is often compounded with the last, is real founder, or an acute inflamation of the lamina which lines the hoof, and thus surrounds the coffin bone. This dreadful disease is of frequent occurrence, and is caused by over exertion, high feeding, cold water and exposure.

The pain and suffering is very agonizing and persistent for several days, unless relieved, and the congested condition of the blood vessels between the bone and the unyielding horny box, foreshadows to every intelligent practitioner the real surgical treatment which the patient at once requires. Hence no time should be lost in attempting to obtain relief. The free abstraction of blood, therefore, is the great desideratum, Unload the vessels and the exudation which eventually destroys the foot will not occur, and this should be done at an early moment, at least within forty-eight hours, if you expect to accomplish anything by way of treatment. The soaking of the foot in warm water, both before and after bleeding, and the application of a flax seed poultice will be found to be very serviceable in every aggrivated case.

In fact without a knowledge of the fundemental principles of pathology and its allied branches disease of any kind cannot be investigated nor its real nature understood; for in every morbid action there is an abnomal condition of the system or of certain parts. Any inquiries, therefore, pertaining to the character of a given malady, necessitate a previous knowledge of the structure and function of the parts in-

volved, without which every conclusion must be questionable. Hence the many existing fallacies about the nature and causation of disease that have no foundation in fact, but have crept into popular favor through lack of professional ability on the part of those who pretend to be qualified practitioners, without having taken a regular course of study.

THE SWINE PLAGUE.

This is a specific infectious disease, peculiar to swine, and is not communicable to man or other animals. It rarely occurs but once in an individual, as one attack serves to protect the system against a second invasion. The disease is especially contagious by the breath, and all hogs thus exposed are liable to become infected. Hence the necessity of strict quarantine regulations in the management of every outbreak, and all sick ones should at once be secluded from the herd.

The symptoms by which this malady in its difierent phases can be recognized are of a threefold character, and which may well be designated as the febrile, the choleric and hemorrhagic. At first the hog shows some indisposition, has a slight rise of temperature, and occasionally coughs. In fact, the majority suffering from this form of the disease would scarcely be recognized as being sick upon casual examination.

But in the second stage, when the "cholera" symptoms appear, there can no longer be any doubt. The disease now assumes a grave form, and is usually attended with a high rate of mortality. The animal becomes inactive, refuses to eat, but is very thirsty. The high temperature, labored respiration and severe cough indicate, in a marked degree, an internal inflammation. Pneumo enteritis, therefore, well expresses the real pathological condition of the malady.

The bowels are at first constipated, but soon followed with a fetid diarrhœa, which hastens fatality. The discharges are slimy, and often stained with blood, which symptoms are very characteristic of the nature of the malady. A reddened skin is a very common symptom, and this, together with the enlarged lymphatics of the groin, become an aid in diagnosis.

In the hemmorrhagic forms the disease occurs without premonition, is very violent in character and invariably fatal. A state of collapse is, in fact, the first symptom. The extremities become cold and numb, and the circulation is very inactive. Hence the stagnation of blood, with a dark purple hue of the skin and large ecchymosed spots is the inevitable sequence.

This swine plague can be communicated by the inoculation of the

bronchial mucus, and the fluid from the peritoneal cavity. The blood is also virulent, thus showing that the disease belongs to the same infectious group with pleuro-pneumonia, small pox and tuberculosis, and accordingly spreads by contagion only. Medicinal treatment, therefore, can have but little effect in cutting short the course of this malady. Conduct the mild cases to a favorable determination is all that can be reasonably expected, yet all unsanitary condition should be carefully looked after.

CONTAGIOUS PLEURO-PNEUMONIA.

This is another and destructive malady of bovine animals. It never attacks the horse and hog, nor can it be conveyed to the human subject. The disease spreads by virtue of its own infection, and never occurs spontaneously. No filthy abode, nor any combination of unsanitary conditions can produce it without the presence of these stealthy germs to contaminate the place. This dreaded scourge, therefore, is not easily controlled wherever it occurs, and since the first introduction of the lung plague in 1843, the herds of the New England and Middle States have not been free from its local ravages. During its history of forty years upon our virgin soil, the germs of this contagious malady have become so effectually disseminated along the Atlantic coast that fresh and unexpected outbreaks are now of frequent occurrence, especially in the vicinity of New York, where the disease first made its appearance.

The western movement of our thoroughbred stock of late years has opened new channels for the development of the disease; and unless immediate action is taken by Congress to intercept the impending scourge, this potent germ will ere long be found lurking among the vast herds upon the plains. All nations have their eyes upon us, and the age demands, in behalf of the millions interested in live stock property, that this contagious pestilence should now be exterpated from the land. In fact, the increase and sudden invasion of disease among our herds of late years should awaken new zeal in every farmer and admonish the whole people of the necessity of a veterinary inspector in every State, authorized to act in every emergency, and backed by a code of quarantine laws upon the statute book, which the State Commission should have full power to enforce. The want of such organized bodies has cost this country a sad financial experience. The Old Bay State in 1860 suffered a heavy loss for want of competent authority to decide the nature of an alarming outbreak of disease, that soon proved to be the dreaded pleuro-pneumonia direct from its native haunts in Holland. In fact this and other simiular freaks of the lung

plague only illustrates the great liability of its future invasion through any of the Western States, unless protected by quarantine laws.

TUBERCULOSIS IN CATTLE.

Though other plagues operate in a more summary manner, yet the ravages from this disease are none the less to be dreaded. The sure but stealthy march, of late years, which this insiduous malady has made upon some of the finest herds of our land has awakened a deep interest among breeders concerning its real specific nature and hereditary transmission.

The old-fashioned and long-known scrofulous consumption of cattle has now been placed, by the rapid advancement in veterinary pathology, among the contageous diseases. The great liability, therefore, of its direct transmission to human beings through the agency of infected milk, is one of the most important questions to-day before the public. Consequently, the wide-spread prevalence of this fatal malady among the cows of this country will soon call for new sanitary regulations.

The contagious nature of tuberculosis, as shown by recent experiments on animals, can no longer be doubted, and it is now conceded by comparative pathologists that the bovine form of this disease is identical with that of man. Consequently there is great liability of its transmission, either by inoculation or ingestion. In fact, it has repeatedly been produced in rabbits, Guinea pigs and calves, by feeding them with tuberculous matter. A disease, therefore, that can be transmitted from one animal to another by inoculation, and thus an identical virus reproduced is, strictly speaking, contagious. But further and more convincing proof on this subject has been furnished by Prof. Chauveau, of the Lyons Veterinary School, who, for years, has been experimentally studying the intimate pathology of the various *contagia*. The success of these researches has afforded some startling results pertaining to the use of diseased meat. The discovery, also, that certain rich virulent matter can infect as readily through the digestive organs as by any other channel, has given him a world-wide reputation. And his well-designed experiments on cattle, which he instituted in 1868, have settled forever among comparative pathologists the question of the virulency of tuberculosis.

Accordingly, the meat of animals affected with this disease should not be used, for any organ or texture in which tubercle has been deposited is surely a dangerous article of food. Much will depend, however, upon the severity of the case and extent of the morbid changes that have taken place. Thus, from what is known in relation to the pathology of this virulent malady, we should at once interdict

the sale of consumptive beef and milk, especially in the advanced stages of the disease, when the glandular tissues have become involved. As the commencement of phthisis is often so insidious in the human subject, and so very difficult at times to arrive at the exciting causes, it is to be feared at least, that one of the sources of its invasion according to recent experiments, is to be referred to the utilization of the carcass, but more particularly the milk of such diseased cattle, as food.

There is every reason, therefore, says George Flemming, F. R. C. V. S., veterinary inspector of the British army, and the accomplished editor of the London Veterinary Journal, to prohibit the use of milk from cows affected with tuberculosis, and especially for infants, who mainly rely upon this fluid for their sustenance, and whose powers of absorption are very active. Even if it did not possess infective properties, its deficiency in nitrogenous elements, fat and sugar, and the increased proportion of earthy salts, would alone render it an objectionable article of diet. In fact, it has long been known that it was liable to produce diarrhea and debility in infants; but though many children fed on such milk have died from tuberculosis, or a localized type of it in the bowels known as *tabes mesenterica*, the part probably played by this liquid in its production has rarely been suspected.

The recent investigations of Prof. Otto Bollinger, of dhe University of Munich, on the artificial production of tuberculosis, as induced by the consumption of diseased milk, has thrown additional light on the subject. He claims that the milk of such animals has a pre-eminently contagious influence, and reproduces the disease in other animals experimented on from that point of view. He believes, also, that such milk, even when boiled, still retains its injurious properties. Further, he maintains that beyond doubt the tuberculosis of the human subject, though not completely identical with that of the cow, is yet strictly analogous to it, and that, consequently, the wide prevalence of tuberculosis in the native herds, at least 5 per cent. of which are affected, is a standing danger to the health of the community. Seeing the enormous mortality from consumption, more especially in towns, Bollinger believes it to be of the utmost importance to urge upon all classes, and particularly upon farmers, the absolute necessity of taking every possible means of stamping out the disease among cattle. Meanwhile some measure of safety may be secured by the rigid exclusion of all diseased stock from town dairies, a measure which forms a prominent feature in the programme of the recently-established Associated Dairy at Munich, where all the cows are constantly kept under skilled veterinary surveillance, and any that may exhibit the least symptom of tuberculosis are at once weeded out.

ALVINE CONCRETIONS.

The occasional presence of these bodies in the stomach and bowels of animals must have been known to the savage and the hunter from remote antiquity. The early anatomists were aware of these formations, and some conjectures had been made concerning their physical properties by Pliny, Galen and Aristotle; but no particular importance was attached to such concretions until the Arabian physicians in the tenth century called attention to them as a novel article of *materia medica*. The marvelous virtues which this new medicine was supposed to possess, and the wonderful cures that were claimed to follow its administration, gave a new impulse to the fame of the healing art in the oriental world.

The concretions from the animals of the New World were called Occidental Bezoars, in contradistinction to those in the East, but the term was afterwards somewhat indiscriminately used and applied by various authors to any calculous formation that did not possess the true character of those from the goat. Many calculi were brought from South America and the West Indies, and Walton, who had thoroughly investigated the subject, says: "It is peculiar to the order of ruminants to form two species of concretes of the stomach, which, though they have the same origin, are nevertheless different. These are, the egagropiles, or hair-balls, taken from the insides of horned cattle; and the others are bezoars, or solid stones, discovered in the algazel and other quadrupeds of India and Persia, and in the sheep of Peru; but mostly in the guanco."

Hair-balls, or the German bezoar, so called, are of frequent occurrence in the domestic animals, like the specimens before you. These are composed of hair matted together with mucus, and are of various forms and sizes, but the majority of them are round or oval. In the early state, as seen in the calf, they are simply a ball of hair, but later they become more or less infiltrated, and finally are coated over. The crust is of various degrees of thickness, according to the time it has remained in the stomach or bowels as a foreign body; for they serve as a nucleus, and may become very firmly incased in a real calculous formation. The color is quite variable, from a light brown to a dead black. The surface may be very smooth and glistening or rough, and sometimes tuberculated, especially if the deposit is thick and dark-colored. These are also known as Aegagropiles, a term derived from the Greek name of the wild goat, as they are frequently found in these animals associated with other concretions. They are the most abundant, however, in the calf, and sometimes grow very rapidly. I have

one taken from a veal six weeks old that is three and one-half inches in diameter, made of its own hair. The calf was in fine condition, and thriving nicely at the time of slaughter. A similar concretion is found in sheep and lambs, made of wool felted together, and quite often hair will be found mixed with it, especially in the cosset. These may also become incrusted or coated over, and the shell is composed of an animal matrix originally in the form of mucus in which there is a deposition of mineral matter, usually the phosphate and carbonate of lime. Thus, of the great variety of adventitious products met with in the animal body, composed of various substances, both organic and inorganic, none are more interesting in their formation, or have excited a greater curiosity among naturalists and the superstitious, than those stony concretions found in the alimentary canal of the horse and certain ruminants.

CALCULUS DISORDERS.

The extent to which urinary gravel occurs in domestic animals, and the symptoms by which the trouble can be recognized, has not received that attention in this country which the subject now demands, especially the urethral calculi in the ox, and the fatal consequences that are sure to follow if not attended to at once.

These concretions in cattle are usually not very large, but occasionally one has been taken from the kidney of nearly an inch in length. Those in the bladder are sometimes very numerous. Hundreds of them have been found varying in size from the finest sand to a black cherry, and sometimes larger, in case there are but few. They are globular in form, usually quite smooth, and polished on their surface, and occasionally tuberculated, resembling the mulberry calculus of the human subject. They generally present pseudo-metallic luster, as though they had been silvered and brightened, and have, therefore, been called "pearls" from the ox. The smooth ones, when broken, readily separate into a series of concentric layers, but the tuberculated ones do not; they are very hard and massive in structure.

These calculi, when too large to pass through the urethra of the ox, get lodged in the curve of the canal, as seen in the accompanying diagram. Inflammation occurs around the obstruction, and there is a difficulty in urinating, and with only a small drizzling stream. The tissues of the urethra become swollen, thickened, and the canal closed. No water is seen now to pass, the bladder fills and soon becomes distended to an enormous extent. The ox is now in excruciating pain, is very uneasy, gets up and lies down frequently. He tries to urinate, but in vain. These symptoms continue for about twenty-four hours,

when the animal becomes easy, and the farmer begins to be encouraged, thinking that his patient is getting better; but this is not the case. The bladder has now burst, and the symptoms are of course less aggravating; the animal lies quietly, looks back at his flanks, and moves occasionally. In this condition an ox will live for several days without giving the owner any apprehensions of a fatal termination, and, usually, until the abdominal cavity is completely filled with urine.

Urinary calculi, in the lower order of animals, are far more simple in their composition than in man. They are not composed of as many layers, nor is the chemical nature of their constituents as complicated. They rarely contain those complex organic principles which constitute the greater part of the concretions from the human subject; but they are made up of carbonates, phosphates, and other organic compounds.

The carbonate of lime is a very prominent constituent in the urinary calculi of herbivorous animals. This salt cannot be precipitated in an acid solution, hence it never occurs normally in the urinary deposits of the carnivora; but in the horse, ox and sheep, where the urine is almost invariably alkaline, it enters into the formation of by far the greater number of calculi met with in the urinary system. Similar calculi occur in the horse, and are almost of the same identical composition, consisting mostly of the calcium carbonate; but those found in the hog contain a small proportion of the carbonate of magnesia.

In the horse these concretions often become very large and thus cause great difficulty in urinating, as shown by frequent straining, and the passage of blood for weeks and months. The several successful operations of lithotomy, however, which I have performed, and the removal of large stones from the bladders of both the horse and mare, affords us hope that this serious difficulty, which no doubt is of more frequent occurrence than we have hitherto been aware, can be readily overcome and the patients permanently cured.

That while an ox may be invariably rescued by the removal of the calculus before the bladdler bursts, I am now satisfied, from further observations on the surgery of such cases; that an animal may be saved by another and more delicate operation if performed a few days, even, after the rupture, before the patient becomes loaded down with water, and thus completely prostrated.

GLANDERS AND FARCY—ITS NATURE, PATHOLOGY AND TREATMENT.

This peculiar type of disease belongs to the infectious group, and has a specifically elaborated virus, which, like that of a small-pox, can

be cultivated to any extent by inoculation. Though differing phenomenally in many respects, the germs of glanders and farcy are pathologically identical, and one form may be reproduced from the other by artificial means. In fact, this is the most trustworthy criterion for deciding a doubtful case of either, as I have frequently shown by experiment.

Glanders, in view of its increasing prevalence and malignancy, ranks among the few great scourges of our land, and is by far the most contagious and loathsome malady of the equine race. It is transmissible, by inoculation, to man and all domestic animals, except cattle, but it is never the sequel of any other disease, unless these potent germs had previously been implanted there, either by intention or exposure.

Though glanders or farcy, in their fatal aspects, are well marked and unmistakable, yet the disease is often obscure, and the diagnostic features for a long time remain latent. The symptoms, therefore, by which it can be recognized at an early moment are of great importance to the owner and the public, for the protection of life and property. The discharge from one nostril is not alone characteristic, and even this varies greatly in quantity and quality in different stages of the real malady. The enlarged submaxillary gland on the same side, especially if it is not hard, inflamed and tender, renders it more suspicious, but when a *chancre* appears in the nostril, the case is beyond a doubt. Without the corroboration, therefore, of these three cardinal symptoms, or a successful inoculation in a healthy subject, no one would be justified in sacrificing a valuable animal, unless they knew that the horse had actually been exposed.

Such doubtful cases can only be decided by resorting to a series of experimental inoculations, as we did with H. S. Merwin's pair of black farm horses of Durham, Conn., when condemned by the State Cattle Commission, and backed by the professional reputation of two of the most noted experts in this country. The six inoculations that we made, and which answered in the negative every time, won a victory for veterinary science, that the Legislature and the Governor endorsed. Accordingly, the horses are now free, and the thriving condition in which they came from a fifteen months' quarantine, more than two years and a half ago, enables the owner to drive the finest team his town affords.

The treatment which a well marked case of glanders or farcy should receive is not professional. As soon as the real nature of the disease is known, the animal should at once be sacrificed. All efforts to cure an undoubted case is futile. The progress of the disease may

be checked, for a while, by rest, good care, and constitutional treatment, but as soon as the horse goes to work again, and thus begins to lose condition, the case becomes aggravated, and death is sure to follow.

In certain chronic forms, however, an animal has been known to live for several years, and thus be the means of disseminating the contagion. Consequently all suspicious cases should be held in quarantine until the real nature of the malady in question can be determined by inoculation, as we did with Merwin's horses, and this should be resorted to at once, if the crucial test upon the nasal membrane is not in sight.

THE TEXAS CATTLE DISEASE.

During the spring and summer seasons, for more than a quarter of century, there has been an increasing demand for Cherokee and Spanish cattle to supply the ranches of the northern stock men. The mingling of our native stock with those wild and roving creatures results almost invariably, in due course of time, in a very peculiar, yet strange and malignant malady. Its invasion has often been very sudden, but it rarely breaks out before the first of August and continues untii cold weather. Though this disease of late years has been of common occurrence in the Western, Middle and even in the New England States, yet farmers had no experience with its ravages until the general traffic in Texas cattle was established. Several efforts have been made to protect our nothern stock from extreme exposure along the line of transit, yet the great demand for store cattle has greatly interfered with any quarantine measures that might otherwise have been desireable. Accordingly our native animals have been exposed both in the pastures and on the cars. In this way an annual contagion has been disseminated throughout the land and often with serious consequences to the ranchman who fattens his cattle for the eastern markets.

NATURE OF THE MALADY.

The native haunts of this disease are the tide waters of the Gulf. It never occurs spontaneously in a region visited by frost, and when carried beyond this thermal line in summer, soon dies out on return of cold weather. In the Northern States it is not contagious from one native animal to another, and consequently this malady can only be induced by exposure to southern cattle that have not been wintered beyond the line of snow. This disease, therefore, must be regarded, in the light of comparative pathology, as a specific fever, uniform in its

type, from year to year, and propagated by contagious effluvia. The alvine discharges are undoubtedly the principal source of infection, as the exposures on the trail have so often and conclusively demonstrated, and also shown by experiment.

This malady usually occurs but once in an individual, and only in bovine animals, as the horse, sheep and swine are never affected, however much they may have been exposed.

That all contagious diseases have a continuous existence like the succession of organized beings, and thus arise from special causes, no competent pathologist of this age of progress will deny. As, in the vegetable world, each seed produces its kind, and the acorn never contains the germ of any other tree but the sturdy oak, so each infectious disease has its own specific virus, which can induce no other malady than the one from which it was derived. Thus every disease germ must come from pre-existing ones, and consequently the spontaneous origin of any infectious malady is quite as untenable in the present state of science as the equivocal generation of plants and animals.

Long before the *contagium vivum* had been discovered, pathologists, believing that the morbific principle affecting the system, in a large group of epidemic and sporadic forms of disease, closely resembled the action of a ferment, proposed the zymotic theory, which, though vague in its chemico-physiological significance, has been almost universally accepted by modern authors. The analogy seemed very striking in many respects, even when first enunciated, that the active agent of fermentation was a minute vegetable organism, which grew and multiplied at the expense of the saccharine liquid, virtually paved the way for the germ theory of disease.

The sterling achievements in comparative pathology which the last decade has wrought relative to this philosophical theory have not only awakened a new zeal among scientific men, both at home and abroad, but have necessitated the recognition of a *biological factor* in the study of the causation of many forms of disease. The results of these researches have revolutionized, in a great measure, all previous conceptions of the intimate nature of contagion; and it has now been demonstrated by the concurrent testimony of scientific men that the disease-bearing germs of anthrax, and certain other infectious maladies, are tiny parasitic organisms that belong to the marvelous world of *microscopic plant life*, many of which have been cultivated through several successive generations and have been found equally potent to produce by re-inoculation the very great malady from which they were originally taken.

The period of incubation has not been accurately determined by

experiment; but according to our observations in many well-marked cases, from ten to forty days may elapse from the time of exposure before an animal will show signs of being affected. In fact, there is a great difference in the susceptibility of our Northern cattle to this infection. Some may even escape it altogether, while others fall victims to it at once.

The temperature and the time of the year have much to do with its early manifestations. The infection we have invariably found to be the most virulent during the warm, sultry weather, and in a cold, wet season it is usually very inactive. Hence, the time for the appearance of the first symptoms, after a given exposure, is very uncertain. During the dog days most of the exposures are effective, the disease soon follows, and is usually with fatal consequences; but later in the season, the invasion is less marked after exposure, and the mortality much reduced.

The manner in which this infection appears is quite variable, owing to the age and general condition of the animal. In cows, the diminution of milk is one of the first symptoms. The ears droop, the gait is sluggish and tottering, with a disinclination to move. The animal will stand in one position, with head depressed, when more or less trembling will be seen about the flanks. In a few days, the patient looks thin and hollow. The abdominal walls appear shrunken, and the back will be arched, as though suffering from distress or internal pains.

The skin is usually dry and hot, especially about the head, and rarely on any part of the body with perspiration. The bowels are costive, but not unfrequently a fetid diarrhœa will supervene in the last stages. The urine is invariably scanty, high colored, and even bloody. In fatal cases, the bladder becomes distended, its wall paralyzed, and all power of micturition lost before death.

The diagnosis of this malady, therefore, is not difficult, especially with the aid of the thermometer, to determine the degree of fever heat. The elevation of temperature indicates the severity of an attack, and will be found to vary from 101 degrees, the normal standard in cattle, to 107, in fatal cases. The "ticks" are an important aid in doubtful cases. Their presence serves as a label, to tell us either from whence the animal came, or the exposure it has encountered. Consequently, when we find a sick creature that is covered with ticks, and shows a high fever heat on thermometer, we can be almost sure, even at an early stage, that it is a case of the Texas plague. But this will soon be corroborated by a high-colored urine, which, on account of the congested condition of the kidneys, is a characteristic symptom; and, in

fact, we have never seen an animal sick with this complaint that was not affected with hæmaturia.

It is evident that the Gulf cattle are thoroughly acclimated, for they show no indications of the disease, and are to all appearances perfectly healthy. They give the disease to northern cattle, however, though they are not apparently affected. The northern cattle take it, have it, and die with it, but cannot give it; and there have been numberless instances where Texas cattle in northern states have given the disease to the native cattle which have passed over their trail, and this is more especially the case in midsummer and early fall when the cattle from the Gulf have been taken to the northern states and allowed to mingle with the native cattle. But if the Gulf cattle are driven northward earlier in the season, after feeding for two months or more upon the sweeter and more luxuriant grasses, their physical condition will have been so changed that according to the condition of the seasons, they will not communicate the disease; and when driven later the disease is sure to die out, especially upon the return of cold weather. From our earlier knowledge of this trouble, in 1853, to the present time, the disease has invariably followed the trail of Texas cattle north; and it was never known to originate beyond the line of snow. In fact, the northern portion of Texas, known as the "Panhandle," is free from the disease unless carried there by Gulf cattle, and those stockmen are as anxious and particular about it as are the people of Kansas and Missouri; in fact, the cattle of the Panhandle will take the disease from the Gulf cattle. In view of this fact, the reconciliation of the north and south in reference to the shipment of Texas cattle is one of the most important questions of the day, and, in my opinion, one which may lead to political warfare before its final settlement.

POST MORTEM APPEARANCE.

The morbid aspect of the internal organs after death, is so marked, that we are enabled to decide a doubtful case at once. The spleen, or milt, is always found much enlarged. It is often increased to five times its normal weight. This organ is so completely engorged with blood, that chemical changes set in before death. The tissues will, accordingly, appear soft, and not unfrequently the viscus is found ruptured. We have examined several cases where the spleen was more than two feet long, eight inches wide, and three in thickness, and weighed ten pounds. Such an organ cannot easily be overlooked.

The liver has a softened and waxy appearance. It is very yellow in color, but with an occasional tinge of greenish black. This organ is usually much congested and enlarged, weighing from twenty to

to thirty pounds. The gall-bladder is surcharged with dark, viscid, and flocculent bile, the granular nature of which is brilliantly shown by transmitted light.

The kidneys, as before observed, are congested, swollen and softened. They are often so much enlarged as to appear disturbed in form, as though they were twisted. On section, the tissues are dark and unnatural in appearance. Hence the bloody urine, scanty though it be, that must escape from such an impaired organ at once becomes of vital importance in the animal economy.

In ordinary cases, the heart and lungs show no signs of disease. But there is more or less inflammation and erosion about the stomach, especially in the fourth apartment, known as the *abomasum*. This, with the upper portion of the bowels, is congested and partially softened, the effects of which changes are often seen in healthy Texas cattle when slaughtered in Northern markets.

The blood also undergoes important changes. The red corpuscles are perceptibly modified in form and size, as well as wonderfully diminished in quantity, in the last stages. Hence the reason for the diffusion of the coloring matter all over the body, before death. Bile can always be detected in the blood of one of these sick animals, and thus acts as a solvent on the anatomical elements. Cholæmia, therefore, exists, as shown in all the exudations beneath the skin and in all the internal organs.

With the condition of the system as seen from a *post mortem* examination, treatment can avail but little. Various plans of medication have been resorted to, but thus far with questionable results. No specific medicines have yet been found to stay its ravages. Eliminatives and antiseptics would naturally seem to be called for, and have been given in certain cases with good results. Mild physic, like alder-bloom tea and boneset, as well as a decoction of the cactus, known as prickly pear, have produced favorable results on thoroughbred stock, brought in there for breeding purposes, and which pass through an acclimative fever, sicken and die, the same as our Northern cattle do when exposed to this subtle contagion on the trail.

[NOTE—The following three Bulletins of the Agricultural College are used for the reason that, with the exception of Number 12, which is valued for preservation because of its long period of duration, they cover questions treated of in this report, and which are of much public importance.]

BULLETIN NO. 12.

TESTING SEED POTATOES.

AGRICULTURAL COLLEGE FARM,
COLUMBIA, Oct. 20, 1884.

S. S. LAWS, LL. D., *President University of Missouri:*

SIR:—Among the multitude of unsettled problems of agriculture seemingly easy of solution, yet over which the farmer is still perplexed by a multiplicity of views and reported experiences, is the simple yet important question of seed potatoes. Shall they be used whole or cut? If cut, how; or shall we use small or large seed? Many assert that inasmuch as the tuber is not the true seed, which seed is found on the tops in the potato ball, and, that inasmuch as the eye is but the bud, it matters not whether the plant is propagated from a large potato or a small one, from one eye or from many. Between the extremes in the practice of the various methods of seeding there is involved, at least the use of ten bushels extra of seed per acre, and at this point, Columbia, of a money value ranging from $5 to $15 per acre, with the varying prices of the seasons.

The test of methods of seeding potatoes, I have now conducted for nine consecutive years, upon three farms of diverse characteristics, and with one result. Two of those tests I will not be able to relate, namely: The first one on a private farm, and not recorded; the sev-

enth, at a college farm from which I removed before harvesting, but not until I saw clearly that the result would surely be in agreement with the five preceding tests upon the same farm.

All the above tests were, for each farm, made under similar conditions, each farm using the same variety of potato, usually the Early Rose, and on soil of similar condition.

TEST FOR 1877.

Except for the last two years, the tests were made at the N. H. Ag'l College Farm on a clayey soil, and upper terraces of the alluvial soil of the Connecticut river; potatoes, Early Rose. As potatoes vary in their proportion of eyes the variety used is a factor in the case.

Seed planted.	Table potatoes.	Yield per acre in bushels.	
		Small potatoes.	Total yield.
Whole potatoes, large.....	90.5	103.6	194.1
Whole potatoes, small.....	54.3	54.3	108.6
One eye to a hill.....	37.1	19.9	57.0
Two eyes to a hill.....	66.1	37.1	103.2
Three eyes to a hill.....	70.I	43 5	113.6

Table potatoes mean, in above statement, all potatoes above the size of a large hen's egg.

The growth of the tops in the early season displayed more difference in favor of large seed than the harvest indication, showing that a vigorous leaf at the early period of potato growth is of much importance. This difference has been noted every year of the trials.

The following table will give the average results for the four years succeeding the above period and on a more elaborate scale. It was sought in these trials to ascertain whether the cutting of the potatoes, or the use of small potatoes affected the constitutional vigor or impaired the yield in after years by using the descent of small or of cut potatoes for seed. For this purpose, the product of small potatoes were saved and small seed or potatoes from these were again used for seed. This process continued for four years for each method of seeding, i. e. large potatoes were selected from the product of the seed of large potatoes, etc., for each sort.

Small seed potatoes will mean potatoes under the size of a hens egg, and one eye will be understood as being cut from good sized potatoes.

AVERAGE YIELD OF FOUR SEASONS.

	Whole potatoes, large	Whole potatoes, small	Seed end	Stem end	One eye to hill	Two eyes to hill	Three eyes to hill
Table potatoes	149.2	127.8	114	90.7	60.1	83.9	105.7
Small potatoes	105.8	65.15	68.7	61.8	24.9	39.9	48.4
Total yield	225	192.9	182 7	152.5	85	123.8	154.1

The above figures while not expressing all that the eye of the observer might have seen, speak so clearly in the final result that all can see the lesson clearly and without explanation.

TRIAL FOR 1883.

This trial was made at the Missouri Agricultural College Farm, on a heavy clay loam soil with marly subsoil.

METHOD OF SEEDING.

	Whole potatoes, large	Whole potatoes, small	Seed end	Stem end	One eye to hill	Two eyes to hill	Three eyes to hill	One eye cut
Table potatoes yield	54.1	33.3	53.1	38.5	30.7	44.8	44.8	30.2
Small potatoes yield	58.3	31.2	44.7	32.3	10.4	14.5	16.6	13.6
Total yield	112.4	64.5	98.8	70.8	41.1	59 3	61.4	43.7

The soil upon which the above potatoes were grown was unfertilized and the crop only a moderate one for the best plat, but yet under the same conditions for each. The result was as in previous trials, while the leaf and stem development were equally favorable for large potatoes.

SEASON OF 1881.

	Total yield.
Seed, whole potatoes, large	176 bushel.
Seed, whole potatoes, small	152 "
Seed, seed end of potato	149 "
Seed, stem end of potato	150 "
Seed, one eye to hill	5 "

The last trial is the only one for nine years that the seed was not cut and the planting carried forward under my personal supervision. The one eye and two and three eyes to a piece system of planting in this case was a failure. Not much over one-half of the seed broke the ground in germination; and a part that did in hilling slightly by a cultivator, were so small and weak, compared with fuller seeding, that a few slightly covered died. The balance under a very wet season, here, did not thrive. I have not given the produce of the others because the figures would be of no value. The one eye result is given to show how great a variation may occur under unfavorable conditions, between ample seed and deficient seeding. Many good farmers advocate the use of one eye to a hill. Among the very few official trials that have come to my attention, I have seen none that favor this view of farmers, in the ordinary way of cutting potatoes. Since beginning these trials, I have seen two foreign tests, covering about seven years each, wherein the effect of cutting on the future vigor of the plant was studied, with results against fine cutting. One eye and small potatoes gave less favorable results at the Ohio experiment station last year than whole potatoes.

I think it entirely safe to affirm that light seeding of potatoes, or the use of small potatoes for seed, will result unfortunately in ordinary hands on ordinary soil in ordinary fertility, especially if deeply planted. The reasons for these views rests mainly upon the fact that the tests show them good, and that, theoretically, judgment approves them. The young plant receives no nourishment, except from the seed used, until the leaf appears above the ground. At the usual depth of planting, this period is so long that no inconsiderable support is derived from the seed before other sources supply the plant. The reason of the failure of one eye this season, in new hands, to appear above ground, I ascribe in part to unusual depth in planting and the failure of nourish-

ment to give it vigor for the three weeks in which it is pening its leaves to the air. That this nourishment is often of vital importance is seen in the far greater vigor of plants from large seed against seed cut or against small potatoes. The leaf is broader, the stem stronger and the whole top always, in my experience, much in advance of those tops grown from severely cut potatoes or those grown from small potatoes.

Those farmers who have found, or think they have found, from measurement by their eye, that light seeding is as good as heavy seeding, are usually those who have an extra rich soil or who give it an extra rich dressing of manure and fine pulverization, and who do not plant too deeply, I infer. Such conditions give food to the plant, relatively quick, through its roots. I found that the relative results vary with the season. Thus the more favorable the season and the better the conditions the greater the relative yield from light seeding. Our farmers must then bear in mind that the good results reported form light seeding of potatoes are often guesses, generally from market gardeners, or obtained under favorable conditions, while the failures are not reported. Good conditions you want.

The following table will give the average returns for seven years from measured ground and weighed potatoes, the product of two farms, and in agreement with unrecorded results on a third farm.

PRODUCT PER ACRE.

From seed of whole potatoes, large	224.1	bushels
From seed of whole potatoes, small	177.	"
From seed of stem end of potato	148.	"
*From seed of seed end of potato	168.	"
From one eye to hill	81.	"
From two eyes to the hill	104.	"
From three eyes to the hill	160.	"

VALUE PER ACRE AT 50 CENTS PER BUSHEL.

From large potatoes	$118 50
From small potatoes	88 50
From stem end	74 00
From seed end	84 00
From one eye	40 50
From two eyes	52 00
From three eyes	80 00

*Period of six years.

To those seeking for facts to apply to farming for profit, or commercial farming, I invite careful attention to the significance of these figures, covering the length of time and variety of conditions that they do.

Respectfully submitted,

J. W. SANBORN.

BULLETIN NO. 13.

GOOD ROADS AND BROAD WHEEL TIRES.

MISSOURI AGRICULTURAL COLLEGE,
COLUMBIA, Dec. 31, 1884.

S. S. LAWS, LL. D., *President University of Missouri:*

SIR:—The following record of experiments, made in the presence of the students of the Agricultural College to illustrate the value of good roads and of broad wheels for at least farm use, in view of the character of Missouri country roads and of the narrow wheels in common use, is deemed worthy of publication.

I think it may be safely said that the culture, power and wealth of our farmers may be more rapidly advanced in the future by good country roads than by an extension of our railroad system; that the value of our farms, the economy of their management and the character of our social farm life are now more dependent upon the character of our roads than upon any other single factor, and that a strong organized public movement should be made for their permanent improvement. The value of good roads as mediums of exchange, of communication, and of social fellowship and culture has been none too strongly put by Macauly, who said: "Every improvement of the means of locomotion benefits man intellectually and materially, and not only facilitates the enterchange of the various productions of nature and art, but tends to remove national and provincial antipathies. Of all inventions, the alphabet and printing press alone excepted, those inventions which bridge distance have done most for the civilization of our species." Undoubtedly the character of country roads is one of the most certain indications of the civilization of any people. This stands as a fact in history.

TEST OF DRAFT ON ROADS AND SOFT GROUND.

In the laying-out and in the construction of roads, two main objects are sought, to wit: First, to secure a solid road bed; and, second, the avoidance of grades, so far as practicable. Our trial considers the

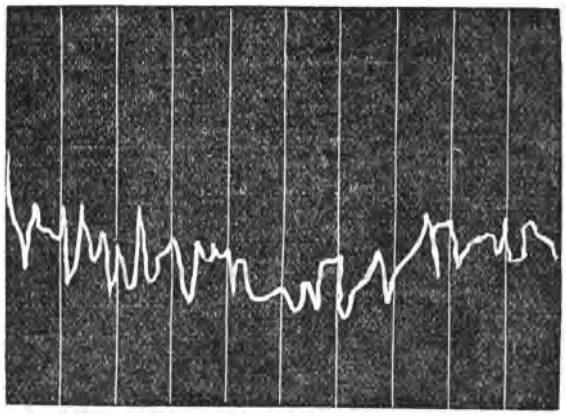
economic factors. The trials were made with a Baldwin recording dynamometer (an instrument for measuring force.) A careful test was made of the Baldwin spring before its use, and it was found correct. The lines above the base of the following cuts, which are representations of the actual results of the trial, represent 100 pounds of tension for every one-fourth inch measured from the base of the cut. Thus the cuts display to the eye the relative draft of the loads drawn under the conditions to be related.

The weight of the loads drawn was 3,665 pounds each. The tires of the wheels were 1½ inches and 3 inches respectively, the former being considerably worn.

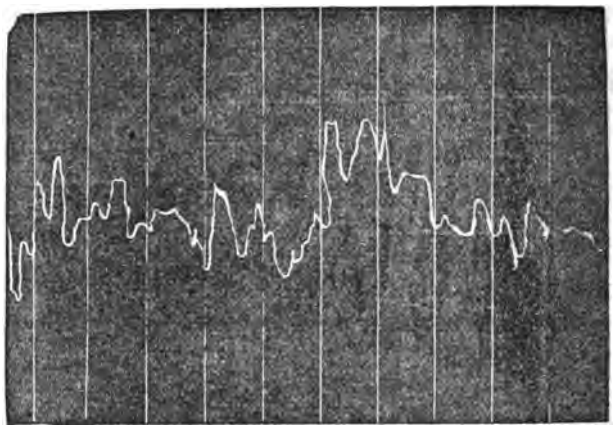
TEST NO. 1.

This test was made on a blue-grass sward, partially moist, yet but little rain had fallen for twelve days. Cut No. 1 represents the draft of the wide tires or felloes, and it averages, for level ground, 310 pounds. Cut No. 2 represents the draft of the narrow tires, which was 439 pounds, or 41.6 per cent. more than No. 1.

In interpreting these tracings measure from the base of each cut to the line of tracing, at any point above the base, and 100 pounds draft is represented by each one-fourth inch. By taking the measurements of the highest and lowest points the elements for making the averages are obtained.



[No. 1. Draft of broad wheels on grass ground.]

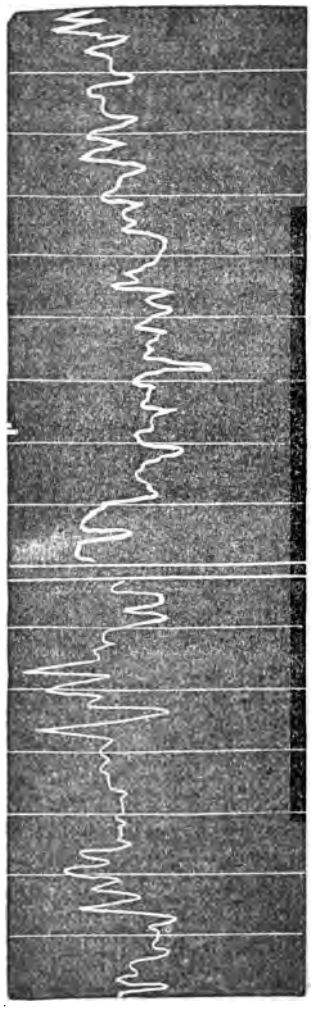


No. 2. Draft of narrow wheels on grass ground.

Assuming the wagon to weigh 1,000 lbs., then on the broad wheels 3,248 lbs. of load would be drawn as easily as 2,000 lbs. on the narrow tires, except the loss from the wheels cutting deeper under the heavier load. Again, the broad wheels in the trial did not injure the turf while the narrow wheels cut through it—an important consideration. Our teamsters for use about the College Farm invariably choose the broad wheels. They find that they are not nearly as liable to get stuck in soft places or during rainy times.

In a subsequent trial on a partially dried dirt road, the broad wheels cut the road less deeply and drew easier than the narrow wheels, as shown in cuts 7 and 8, the draft being for the broad tires 371 lbs. and for the narrow tires 441 lbs., or the latter drew 12.7 per cent. heavier than the former, a net difference per ton load of 381 lbs., or 381 lbs. more could be drawn on the broad wheels to the preservation of roads, as is recognized in two or three States by adjusting the rate of toll to the width of wheels, the toll being remitted on wheels of a certain width. The difference of draft, above recorded, disappears on good roads, as our tests showed, a cut of which I thought it was needless to insert.

No. 7. Draft of narrow wheels on moist dirt road.



No. 8. Draft of broad wheels on moist dirt road.

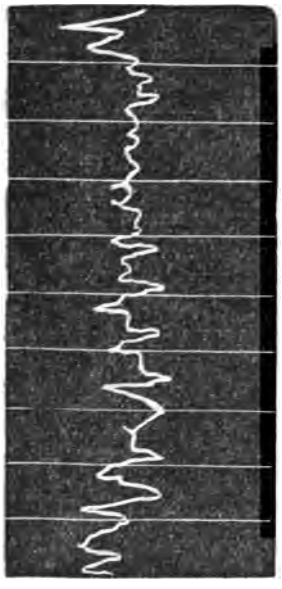
POOR VS. GOOD ROADS.

In these tests the ordinary wheels of the farm, one and a half inch tire, were used. The road was a gravel bed. The first pull was up a grade of 1 foot in 28 feet, and the draft was 310 lbs. This test was made the same day as No. 2 on grass ground, and shows that narrow tires on grass a few days after a rain are equivalent to a draft up a hill of more than 1 foot rise to 28 feet.

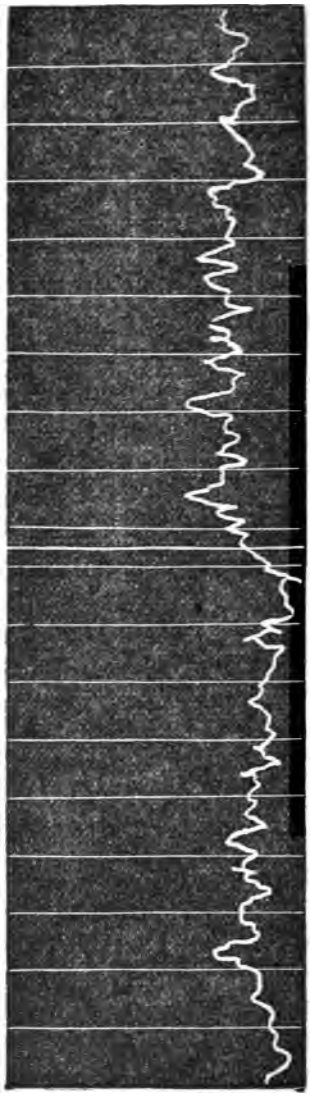
The second pull was on a flat at the top of above grade and drew on a draft of 118 lbs. Cuts Nos. 3 and 4 show the above trial and enforce the importance of avoiding hills and of reducing grades when

practicable, by leveling. The net load drawn would be hardly one-third as much up this mild grade as on the level ground. In addition to this loss we have to add the further loss of capacity of a horse to draw up hill. It is well known that the structure of the horse is such that he works to a diadvantage up a grade. On level ground man power is as 1 to 5, but up hill as 1 to 3 compared with a horse.

The value of grades is well known to railroads and it has sometimes caused their reconstruction or even built competing lines and in the older parts of our country the country roads are often reconstructed at great cost for the business advantage of improved grades.

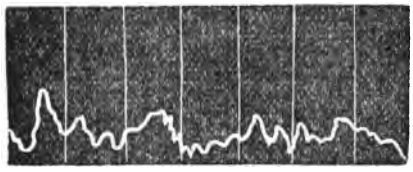


No 3. Draft on grades of 1 to 28 ft. rise.



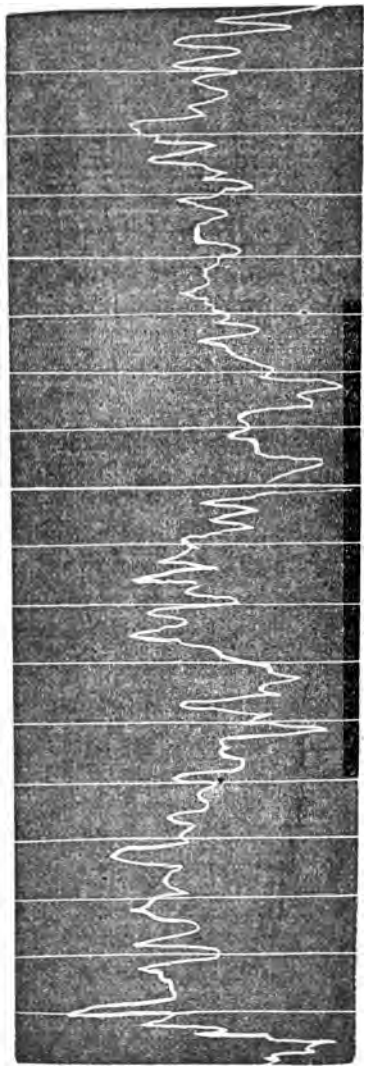
No. 4. Draft on level ground and gravel road.

But a gravel road is not a perfect road, hence, a test was made on a floor and resulted in a draft of 70 lbs. See cut No. 5. Cut No. 6 represents a test on a dirt road 12 days after a rain, but made where



No. 5. Draft on plank floor.

shade trees had kept the ground moist. This test is represented by a longer cut, as are tests 4, 7 and 8, because no ground exactly level could be found, hence I drove each way, and the cut is doubled in length to show each trial and to obtain the average, which presents the draft of level ground.



No. 6. Draft on level moist dirt road.

Cut 6 on a moist dirt road shows a draft of 487 pounds, which is 57 per cent. greater than the draft on a grade of 1 to 28 feet on a gravel road, and four times as great a draft as on a level road, and seven times as great as on a level plank floor. Cuts 7 and 8 show similar results.

The draft registered by no means shows the actual effects on the horse, as it does not take into account the suction of the mud and the slipping of the horses feet, as well as the little hills constantly in front of his feet.

GENERAL REMARKS.

As we view the long periods in which traffic is suspended on our dirt roads, (generally in periods when farmers are not busy) the small loads dragged into our markets, the value of which is largely absorbed by the expense of delivery; the almost universal use of the saddle horse, and the immense loads carried on the solid roads of much of Europe, in connection with the above tests, we are not likely to overestimate the profound relation of our miserably crooked and marly roads, bridgeless creeks, and hills neither graded nor circumvented, to our system of farming, its profits and pleasures.

From the above tests the traffic that will warrant a $2,000 outlay per mile of unimproved roads may be approximately estimated. If by properly grading our hills and gravelling our road beds we can double the freight carried per team, we could, on the basis of 15 miles per day for a loaded team costing $3 per day, save the interest of this cost at 6 per cent. in the passage of 600 loaded teams one way.

But this commercial view is perhaps the least important factor of the case. Roads are luxuries as well as are good houses, good suits of clothes and a thousand things our civilization will have. The road should be constructed on a broader basis than that of money returns, as roads are indispensible links in civilizations' chain.

Respectfully submitted,

J. W. SANBORN.

BULLETIN NO. 14.

FEEDING FOR LEAN MEAT.

MISSOURI AGRICULTURAL COLLEGE FARM,
COLUMBIA, Mo., Feb. 23, 1885.

S. S. LAWS, LL. D., *President of University of Missouri:*

SIR:—Last year I reported the results of a preliminary trial to ascertain the relation of the foods fed to the character of growth. This trial resulted in a larger proportion of lean meat in pigs fed with albuminous foods than in pigs fed with carbohydrate foods. The kinds of food designated by nitrogenous and carbonaceons will become evident as we proceed; and we aim in these bulletins to use as far as practicable the plain language of common life.*

The experiment has been repeated on a fuller scale, yet not on as complete a scale as it is hoped further means will permit in the future.

EXPLANATORY.

First, my desire in this experiment was to ascertain whether the composition of swine is dependent upon and can be varied materially by the character of the food. If so, then a very important principle is established that will enable us to modify the proportion of fat to lean. Our modern breeding and feeding have developed an excessive proportion of fat to lean, when compared to the old time shote. Our modern corn-fed hog is a grease producer, and grease is repugnant to the taste of Americans, and, hence, our consumption of swine products has undergone a marvelous decline. In 1850 we produced 1.8 shotes to every inhabitant, while in 1884 we produced only 0.8 of a shote per inhabitant, being now 62.5 per cent. less than in 1850; while the exportation of hog products has increased 700 per cent.

*For these explanations the reader is referred to an article on Animal Nutrition. The explanation is omitted here to save repetition in this report.

By feeding, can the hog be made more agreeable to the American stomach? The question is of broad importance for, as noted in Bulletin No. 10, 100 lbs. of corn will produce 20 lbs., really over 21 lbs. of pig carcass, while the same food will not produce more than 10 lbs. of dressed steer, having a larger proportion of water and bone in its composition than the pig. Pork is cheaper made than beef.

ANALYSIS OF FOODS FED.

The following analyses were made by Prof. W. H. Wiley, Chief Chemist of the department of Agriculture, Washington, D. C. To this department, whose value is often underrated, I tender thanks for the services rendered, services of a character that I have a strong hope of soon seeing at our own department.

	Water	Ash	Albuminolds.	Carbohydrates.	Fibre.	Fats.
Dried Blood	.....	.. ..	70.87	.....	.....	.....
Corn	8.17	1.37	10.83	70.87	4.64	4 82
Shipstuff	9 22	3.02	16.10	54.86	12.66	4.14

Rating a lb. of fat as equal to 2.40 lbs. of carbohydrates and adding the fibre, as usual, to these materials, we have in corn one lb. of albuminoids to every 8.4 lbs. carbohydrates, and one lb. of albuminoids in shipstuff to every 4.8 lbs. carbohydrates. Thus the nutritive ratio, as it is called, is narrower in shipstuff than in corn, and the narrowest ratio of all food materials is blood, which is almost wholly albuminoid.

FEEDING TRIAL.

July 4, 1884, two lots of three pigs each, were put up in separate pens and fed, wet to a dough, the following foods three times daily, namely:

Lot 1—weight 106 lbs. for the three pigs—food, shipstuff.
Lot 2—weight 111 lbs. for the three pigs—food, corn.
Lot 1—weighed Aug. 19, 197 lbs.—gain, 91 lbs.
Lot 2—weighed Aug. 18, 190 lbs.—gain, 79 lbs.
Lot 1—ate 334 lbs., and lot 2 ate 397 lbs.
Pounds of food for one of gain, for lot 1, 3.67 lbs.
Pounds of food for one of gain, for lot 2, 5.02 lbs.
The economy of shipstuff compared with corn used has been noted

by me every year for 7 years, the figures of which have elsewhere been given, and are as 108 is to 100. In this trial whole corn was given for the first 46 days, after which corn meal was given to whole corn fed lot, and no weights were taken until I began to feed dried blood with shipstuff Nov. 4, to make the ratio of albuminoids greater. To 75 lbs. of shipstuff 25 lbs. of blood were given, so that the ratio of albuminoids to carbohydrates, after Nov. 4, was as 1 to 1.64, or 1 lb. of the former to 1.64 lbs. of the latter, being a very high proportion of albuminoids, or muscle-making food. Nov. 1 lot 1 weighed 352 lbs. and lot 2 weighed 335 lbs. When weighed Dec. 8, lot 1 tipped 466 lbs. and lot 2, 434 lbs. The pigs gained faster on blood and shipstuff than on corn meal. The blood cost $20 a ton.

The blood was simply dried blood used in the fertilizer trade and a very poor sample of it. Here is a case of eating our cake and keeping it, too, for the blood is sold in the pig for more than its value as a fertilizer. When given to a pig about three-fourth's of its manure value is left in the manure heap and is very rich in the nitrogen so valuable for winter wheat. In former trials of such manure for crops, I have shown that here is a place where science has practically aided agriculture.

Pig 1 of lot 1, gave a slaughtered weight of 109 lbs., weight of leaf 5 lbs. Taking a given rib, for each test, about the center of the spinal column, I found 3 ribs weighed 1 lb. 6 oz. Of this roast 15 ounces were fat, 10¾ ounces lean and 1¼ ounces were bone.

Pig 1 of lot 2 slaughtered 116½ lbs.; the leaf weighed 5½ lbs. The roast, cut from same ribs as from pig 1, weighed 2 lbs. 2. oz. Of this the lean was 12 oz., the fat 24 oz. and the bone 2 oz. The percentage of lean to fat in the shipstuff, or albuminoid food fed pig, was 71.6 per cent. The percentage of lean in the corn, or carbonaceous food fed pig was only 50 per cent., or the former had 43.2 per cent. more outside fat that could be separated by a knife than the latter. This difference was plainly visible to the eye.

Pig 2 of lot 1, slaughtered 124½ lbs. Its leaf was 6 lbs., rib roast, as before, 1⅝ lbs., lean of rib 10 oz., fat 12 oz., bone 2 oz. and kidneys 9 oz.

Pig 2 of lot 2, slaughtered weight 116½ lbs., leaf 6 lbs. 6 oz., rib roast 1 lb. 6 oz., lean of rib 6½ oz., fat of rib 14½ oz. and bone 1 oz. Lean to fat of pig 2 of lot 1, 83.3 per cent. Lean to fat of pig 3 of lot 1, 44.8 per cent. Proportion of lean to fat in corn fed pigs over shipstuff fed pig 85.9 per cent. The proportion of leaf to weight of shote is less in the shipstuff fed pig than in the corn fed pig. The relative weight of kidneys is well worthy of consideration.

Pig 3 of lot 1, live weight 154 lbs., weight of blood 5 lbs. 1 oz., weight of intestines and contents 11½ lbs., weight of heart and lungs 2 lbs. 13 oz., weight of liver and gall 3 lbs., weight of spleen 8 oz., weight of ham 10½ lbs., weight of fat of ham 2 lbs. 6 oz., weight of lean meat of ham 7 lbs. 2 oz.; weight of bone of ham 15 oz.

Pig 3 of lot 2, live weight 126 lbs.; weight of blood 4 lbs.; weight of heart and lungs 2½ lbs.; weight of liver and gall 1⅞ lbs.; weight of intestines and contents 11⅞ lbs.; weight of spleen 6 oz.; weight of ham 8½ lbs., weight of fat of ham 2 lbs. 13 oz.; weight of lean of ham 4¾ lbs.; weight of bone of ham 15 oz.

Percentage of fat to lean on ham of shipstuff fed pig, 33.3 per cent.; in corn fed pig, 59 per cent. of fat to lean. The per cent. of fat in corn fed pigs over fat in shipstuff fed pigs is 71 per cent.

FAT IN LEAN MEAT.

Two pigs of each lot were examined for the proportion of fat in lean meat—that is fat among the fibres and not the fat that could be separated by a knife. The test was made from meat selected from both the ham and the loin, and was taken from identically similar locations. Under the microscope little difference was noted between lots one and lots two. Prof. P. Schweitzer, Chemist of the Agricultural College, analyzed the samples with the following results: Lot 1—the shipstuff or albuminous fed pigs gave 5¼ per cent. of fat, while the corn or carbonaceous fed lot contained, among the fibres of the lean meat, 10 per cent. of fat, or 52.5 per cent. more than shipstuff fed lot. The average per centage of fat in corn fed pigs over that in shipstuff fed pigs, for all the tests, it weight of leaf, weight of outside fat and of fat of lean meat, are considered, is 52.4 per cent. Now, as ordinarily, 44 per cent. of the live weight of a fat pig is fat, it will be seen that a most radical and important difference is made in the character of a pig for food by the two systems of feeding. This is a second year's trial, and after witnessing the results, I have not a doubt that an invaluable fact is ascertained in these trials of great importance in animal nutrition, and for meat consumers. I have but little doubt that this fact touches questions in animal health, for excessive fatness is not conducive to good health, and rations that force or require unnatural work of the organs concerned in nutrition, impair their normal action; and I suggest that our excessive loss from certain diseases in this state may be traced to faulty nutrition from excessive use of corn or other unnatural and ill-balanced rations. A review of the relative weights of the vital organs tends to confirm this view, for

it is seen that these organs weigh more after the albuminous food or shipstuff ration. Thus the kidneys of the corn fed pig were 44 per cent. lighter than those of the shipstuff fed pig; the blood 3.6 per cent. less per pound of live pig; the liver about 3 per cent. less. Fuller work is needed, however on this point, and will be given, and these facts regarding vital organs are now mainly suggestive.

While every fact given has been very carefully taken, and made reliable, yet I have deeply to regret that I did not have the means and time to make an exhaustive study of the subject. Every animal should have been tested in full for all of its proximate arganic constituents, for weight of blood and every vital organ. Unavoidable calls in other directions limited my work. I may repeot again, that we are building up a farm below the level of the equipment of ordinary farms, from the income of the farm, without outside aid. Volunteer experiment work of this kind is necessarily very limited.

Another year, we hope, will make this work complete, especially so if the much needed aid now sought from the State is secured.

Summarizing the points of interest in this trial, to the practical farmer, we get the following: First, a pound of shipstuff, for 8 years, under weight, has made more growth than corn. Second, the manure from shipstuff is worth over twice as much as from corn, and therefore shipstuff should be fed at home rather than sent to enrich the east. Third, less than four pounds of shipstuff will make a pound of pig, or about 16 pounds of pig for the weight of a bushel of corn, whereas the farmer expects but 10 pounds from a bushel of whole corn. Fourth, the shipstuff gives a much larger proportion of lean pork, and will tend to make pork much more eaten and a healthier food. Fifth, the vital organs, so far as tested, weighed more when pigs were fed shipstuff, and hence, this fact is likely to have some relation to health. Sixth, I may repeat what I have said for years from other experience, that German tables, and the theories upon which they are founded, need important modification.

I believe these facts related, showing so wide a modification of the composition of the animal (we have known that color and flavor of animals vary with food), arising from the food given are contrary to the views held by physiologists, and are new. Doubtless they indicate that the character of fat cattle may be influenced by food, and tend to make the dressed weight of the breeds at fat stock shows poor evidence of the relative value of the breeds for meat, unless compared from animals fed similarly.

Respectfully submittee,

J. W. SANBORN.

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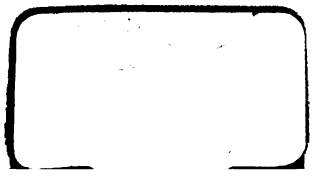
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